A STUDY TO EVALUATE THE EFFECTIVENESS OF BEETROOT EXTRACT UPON IRON DEFICIENCY ANAEMIA AMONG ADOLESCENT GIRLS IN SELECTED SCHOOL AT KANYAKUMARI DISTRICT

COIMBATORE

A DISSERTATION SUBMITTED TO THE TAMILNADUDR.M.G.R MEDICAL UNIVERSITY CHENNAI, IN PARTIAL FULFILLMENT OF REQUIREMENTFOR THE DEGREE OF MASTER OFSCIENCE IN NURSING

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LIST OF ABBREVIATION USED

H	:	Hypotheses
df	:	degree of freedom
NS	:	not significant
χ^2	:	chi square
SD	:	Standard deviation
N	:	Sample Size

ABSTRACT

Statement of the problem :A study to evaluate the effectiveness of beetroot extract upon iron deficiency anaemia among adolescent girls in selected school atKanyakumari.Adolescence is a time of intense physical growth. It is also a stage of stress and strain. Most of them are having poor access to proper health care, nutrition and education. Beetroot juice is particularly beneficial as an anemia remedy for children and teenagers. Many studies proved that beet root also contribute to improve the hemoglobin level in the blood. Hence a study was conducted to assess the effectiveness of beet root juice on hemoglobin among adolescent girls. Objectives: To assess the haemoglobin level among study and control group. To determine the effectiveness of beetroot juice on haemoglobinlevel between experimental and control group .To associate the haemoglobin level with selected demographic variables .Methodology: Quasi-experimental study design was adopted and the study conducted in Government Higher Secondary School, Kanyakumari,Tamilnadu. A total of 60 adolescent girls were selected for the study, out of that 30 girls were in experimental and 30 girls were in the control group who fulfilled the inclusive criteria were selected by using purposive sampling technique. The freshly prepared beetroot juice was administered to the samples for 20 days in mid morning. Pre and post assessment was done using the checklist for assessing the signs and symptoms of anemia and cyanmethemoglobin method for checking hemoglobin level.Results:The data analysis was done by using descriptive and inferential statistics.Samples in the experimental group

showed a highly significant improvement in hemoglobin level following the administration of beetroot juice ($p<0.001$), in comparison with the control group. Conclusion: By this the anemia can be prevented among the adolescent girls and in future the complications due anemia can be prevented.

Keywords: Adolescent girls, haemoglobin, anemia

ABSTRACT

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CHAPTER I

INTRODUCTION

The best and the most beautiful things in the world cannot be seennor touched… but are felt by the heart. Jawaharlal Nehru said, "*Children are the wealth of tomorrow, take care of them, if you wish to have a strong India, ever ready to meet various challenges."* Hence the children still remain as young plants that neither get light nor water, they remain the flowers that could have blossomed. Looking back on their adolescence, adults often conjure up grand memories, and laugh at their mistakes. Children's health reflects the National health and wealth. Today's children are tomorrow's citizens. A well-developed child contribution to the National welfare and children are the priceless resources of the Nation. Children are an embodiment of our dreams and hopes for the future. They are the most vulnerable group in the society.

Adolescence is a period in life that everyone must 'survive' in order to become an adult, although some goes through it more turbulently than others. Adolescence is also a sensitive period , particularly for girls. Adolescence is a time of intense physical growth. It is also a stage of stress and strain. Most of them are having poor access to proper health care, nutrition and education. Teenagers falling approximately between the ages of 12 to 19 years, adolescence are characterized by physical changes, more complex and hidden changes occur in an adolescent's attitude, outlook, and self-identity.

Ultimately, the 'goal' of adolescence is to gain personal independence, and a sense of self. Although these physiological changes happen slowly, the environment is part of the key to survive this difficult period and become a stronger person. Our job as health care professionals in today's society requires an understanding of this problematic time in a child's life, as well as regression into our own adolescence, to better prepare ourselves to rise the generations of tomorrow. Socially, the feelings of adolescent group are at its maximum and want to shine, and prove themselves. Another note worthy point is that the world

adolescent population is 22.5% and 85% of them are living in developing countries.

Girls typically start puberty around age 10-12 and achieve their full adult height by the age of 15. Inadequate nutrition during late childhood and adolescence can therefore have a significant impact on a woman's adult health and the health of her children. Under nutrition during childhood and adolescence is associated with higher risk for preterm delivery and still birth or miscarriage, women with low body mass index and/ or short statures are at increased risk for under nutrition, perinatal and neonatal mortality .South Asia contains some of the highest national rates of thinness and stunting in young women in the world, as well as alarmingly high rates of anemia. According to corporate social responsibility in women health care with Federation of Obstetric and Gynaecological Societies of India(FOGSI) says that about 20% of maternal death occurs due to anemia. According to WHO statistics (2009) MMR is 250.

Anemia is a common health problem among women throughout the world, The World Health Organization (WHO) estimates that anemia affects over 2 billion people worldwide. Anemia is a general term referring to the condition characterized by abnormally low levels of healthy red blood cells or hemoglobin. There are multiple causes of anemia including genetic and dietary factors. The most common symptom of all types of anemia is fatigue (tiredness). Fatigue occurs because your body doesn't have enough red blood cells to carry oxygen to its many parts. Also, the red blood cells your body makes have less hemoglobin than normal. Hemoglobin is an iron-rich protein in red blood cells. It helps red blood cells carry oxygen from the lungs to the rest of the body.

Anemia also can cause shortness of breath, dizziness, headache, coldness in your hands and feet, pale skin, chest pain, weakness, and fatigue (tiredness). Signs and symptoms of iron deficiency may include brittle nails, swelling or soreness of the tongue, cracks in the sides of the mouth, an enlarged spleen, and frequent infections. People who have iron-deficiency anemia may have an unusual craving for nonfood items, such as ice, dirt, paint, or starch. This craving is called pica (PI-ka or PE-ka). Some people who have iron-deficiency anemia develop restless legs syndrome (RLS). RLS is a disorder that causes a

strong urge to move the legs. This urge to move often occurs with strange and unpleasant feelings in the legs. People who have RLS often have a hard time sleeping. Iron-deficiency anemia can put children at greater risk for lead poisoning and infections. Some signs and symptoms of iron-deficiency anemia are related to the condition's causes. For example, a sign of intestinal bleeding is bright red blood in the stools or black, tarry-looking stools.Very heavy menstrual bleeding, long periods, or other vaginal bleeding may suggest that a woman is at risk for iron-deficiency anemia.

Kellec, (1996) Anemia is a quantitative or qualitative deficiency of circulating red cells. The situation back home in India and other developing countries is perhaps worse. The causal factors of Anemia are decreased iron supply from inadequate diet, poor bioavailability of iron, increased physiological requirements, abnormal iron losses, malabsorption of iron. Among the world population, two billion people are affected by anemia and mostly it is due to iron deficiency.

A Beetroot naturally contains Vitamins B1, B2, B3, B6 and Vitamin C, phosphorus, calcium, sodium, potassium, iodine, iron and copper. From the ground and of the ground, many of these elements are picked up through the soil the vegetables grow within. In a similar way that gold finds its way into trees, then iron, calcium and copper is also absorbed by the plant in a similar fashion. These beetroot extract benefits combined bring a variety of Beetroot health benefits and attributes to the human diet.

Prevention is better than cure. The researcher observed that there is less focus on assessment and management of anemia among adolescent girls. Beetroot juice has significant effects on human blood and blood forming qualities due to its higher iron content. It regenerates and reactivates the red blood cells. It supplies fresh oxygen to the body and helps the normal function of vesicular breathing.

NEED FOR THE STUDY

Iron deficiency to be one of the most prevalent forms of malnutrition, yet there has been lack of consensus about the nature and magnitude of the health consequences of iron deficiency and the Public Health importance of iron-

deficiency among population, which was made as part of Global Burden of Disease (GBD) 2000 Project. Iron deficiency has its direct contributions to cognitive impairment, decreased work productivity, and death from severe anemia. Based on meta-analysis of observational studies, mortality risk estimates are decreased for each 1 g/dl increase in mean haemoglobin concentration. On average, globally 50% of the anemia is assumed to be attributable to iron deficiency. Iron deficiency anemia ranks 9th among 26 risk factors included in the GBD 2000, and accounts for 841,000 deaths, and 35,057,000 disability adjusted life. There is an urgent need to develop effective and sustainable interventions to control iron-deficiency anemia.

India has highest prevalence of iron deficiency anemia among women in the world including adolescents 60-70% of Indian adolescent girls are anemic (Hemoglobin (hb<12 gm/dl).[6] Adolescence in India goes hand in hand with iron deficiency anemia, says the latest National Family Health Survey (NFHS). The NFHS-3, conducted in 2005, 2006, presents statistics that mark a growth in cases pertaining to anemia

According to National Family Health Survey(NFHS2009) has reported that a large percentage of women and children in India are anemic. According to International Center for Research on Women(ICRW) (2009) adolescent girls 58% are having <12gm% and 1.3% are having <7gm%.In Tamil nadu, 44.8% adolescent girls are there, in that 2.1% are having severe anemia, 6.3% are having moderate anemia and 35.5% are having mild anemia. In that premenarcheal anemia are 40.7% post menarcheal anemia are 45.2%.

Global data base by WHO (2007) on child growth and malnutrition and National Family Health Survey – 2 (2007) in India, had suggested that adolescent girls of urban, semi urban and rural schools in India are found to be anemic and the prevalence rate to be between 61.9 to 82.1 percentage, being highest among rural girls of higher order as compared to urban poor girls irrespective of their age and menarcheal status. This could be due to differences in dietary habits, worm infestations, poor hygiene, and poor environmental sanitation. Anemia prevalence was more among girls of low weight, height and BMI as compared to those who were heavier, tall and having higher BMI.

The highest prevalence of Anemia exists in the developing world where its causes are multi-factorial defects in human. Anemia is responsible for significant morbidity and mortality, particularly in under developed countries. Understanding the causes of anemia and potential mechanisms are crucial to our ability to interface in reducing this burden. In the past decade, our understanding of the etiology and mechanisms of anemia were less especially in developed countries which have now advanced significantly. This review will focus on recent advances in our understanding of the burden of Anemia in specific sub-group, the causes and mechanisms of Anemia, and consequences of Anemia on the human.

John, (2007) studied the healing effects of beetroot juice. He reported that, Beetroot juice is a healing juice. It acts as a blood building herb that detoxifies blood and renews it with minerals and natural sugars. Beetroot juice provides phosphorus, sodium, magnesium, calcium, iron and potassium as well as fibre, Vitamin A, C, Niacin, Folic acid and Biotin. The study revealed that organic forms of nutrients derived from natural sources are much easier to assimilate than synthetic nutrients. Thus the iron content in beetroot juice is easily assimilated and gives more nutritive value than man made forms of iron supplements. Beetroot is a good choice for correction of anemia. It is cost effective, easily available, no side effects and it can be easily stored. Investigator personally experienced the signs and symptoms of anemia during the adolescent period.

Thankachen et al., (2004) conducted a descriptive study on anemia in relation to economical status of the adolescent girls. The study revealed that anemia is the most common form of malnutrition among adolescents today. Adolescents (10-19 years) constitute >20% of our population in India and 50% suffer from Iron deficiency Anemia. Adolescents from both urban and rural areas are affected by anemia, among whom girls (79%) are higher than boys (21%). Poor economical status, infection and less intake of iron also influence and increase the incidence of anemia among children and adolescent girls.

A cross-sectional survey was conducted in an urban area under Urban Health Training Center, Department of Preventive and Social Medicine, Government Medical College and Hospital, Nagpur,India. A total of 296

adolescent females (10-19 years old) were included in this study. The study took place from October 2002 to March 2003 (6 months). Statistical analyses were done using percentage, standard error of proportion, Chi-square test, and Student's 't' test. The prevalence of anemia was found to be 35.1%. A significant association of anemia was found with socio-economic status and literacy status of parents. Mean height and weight of subjects with anemia was significantly less than subjects without anemia. A high prevalence of anemia among adolescent females was found, which was higher in the lower socio-economic strata and among those whose parents were less educated. It was seen that anemia affects the overall nutritional status of adolescent females.

In rural Tamil Nadu, India, a baseline survey on the prevalence of anemia among adolescent girls was conducted by the Christian Medical College and Hospital. The respondents include 155 young girls aged 13-19 years old from the K.V. Kuppam block and 161 from the Gudiyatham block. Their blood was extracted to assess hemoglobin (Hb) concentration. The other data obtained include demographic variables, socioeconomic and nutritional status. Results indicated that prevalence of anemia among girls was 44%. Of these, 2.1% was severe, 6.3% moderate, and 36.5% mild anemia. Prevalence of anemia exists in 40.7% of pre- and 45.2% in post-menarchial girls. It is noted that the education levels of respondents and their mothers had significant association with the concentration of hemoglobin. However, other indicators of nutritional and socioeconomic status are of significant predictors. Overall, the study illustrates that young girls should be included in the anemia risk group, and that intervention programs are needed to increase the hemoglobin levels among adolescent girls.

A study was conducted on prevalence of anemia among pregnant women and adolescent girls in 16 districts of 11 states of India in 2006. The objective of the study was to assess the status of anemia among pregnant women and adolescent girls. A two-stage random sampling method was used to select 30 clusters. Anemia was diagnosed by estimating the hemoglobin concentration in the blood, using indirect cyanmethemoglobin method. The survey data showed that 84.9% of pregnant women (n = 6,923) and 90.1% of adolescent girls (n = 4,337) were anemic. The study concluded that any intervention strategy for this

population must address not only the problem of iron deficiency, but also deficiencies of other micronutrients, such as vitamin B12 and folic acid and other possible causal factors.

A pre experimental study was conducted on the effectiveness of structured teaching program on knowledge and attitude of adolescent girls in prevention of iron and folic acid deficiency anemia at a selected corporation school, Coimbatore. The objective of the study was to assess the knowledge and attitude of adolescent girls, administer structured teaching program and re assess the knowledge and attitude. The sample consisted of 60 adolescents selected by stratified random sampling technique. Major findings of the study revealed that during pre test 90% of them were has inadequate knowledge and 65% of them have unfavorable attitude towards iron and folic acid deficiency anemia. After the structured teaching program the knowledge and attitude was improved (73% had adequate knowledge and 79% of them had most favorable attitude).

Beetroot is commonly cooked, but the juice of raw beetroot contains host of health benefits and is classed as a “super food” in today‟s nutritional jargon .The pigment that gives beetroot juice its rich, red and purple color is called betaine. Some of the benefits of beetroot juice are lowering blood pressure by dilating the blood vessel and relaxing smooth muscles, increasing the oxygen level, improving the stamina by decreasing the oxygen during exercise, treating anemia by increasing the blood count and improving blood circulation and oxygen carrying capacity of erythrocytes (red blood cells), preventing birth defects by folate and folic acid, preventing hypertension and stroke, cleansing intestine, reducing kidney stone, improving rheumatoid arthritis, gout sand improving menstrual problems. Beetroot juice is particularly beneficial as an anemia remedy for children and teenagers, according to H.K.Bakhruauthor of “food that heal”. Easton Patrick(2011) says that consuming beet root juice or beet as cooked vegetable in salad is highly beneficial in treating anemia.NirmanWalker,D.Sc (2010) , in fresh vegetables and fruit juices, claims that beets build red corpuscles and add tones to blood so that it increases haemoglobin level in blood. Many studies proved that beet root contribute to improve the haemoglobin level in the

blood. The cost is low when compared with other iron rich vegetables and it can be stored easily

Beetroot strengthens the body's immune power and has proved to be an excellent remedy for anemia, especially for children and adolescents where other blood forming remedies have failed. Thus, the researcher was interested to conduct a pre-experimental study to know the effectiveness of beetroot extract upon anemia that may lead to less difficulty and higher success rate.

Personal experience of the investigator and review of literature revealed that adolescent girls are prone to be anemic and have lack of knowledge regarding prevention of anemia. But they are full of energy, have significant drive and new ideas. They are a positive force for a nation and are responsible for its future productivity provided they develop in a healthy manner. We the Nurses being part of the health team have responsibility to educate the adolescent girls and show the correct pathway to prevent anemia. Hence, the above mentioned factors motivated the investigator to undertake the study.

STATEMENT OF THE PROBLEM

"A study to evaluate the effectiveness of beetroot extract upon iron deficiency anaemia among adolescent girls in selected school at Kanyakumari"

OBJECTIVES OF THE STUDY

- To assess the haemoglobin level among experimental and control group.
- To determine the effectiveness of beetroot juice on haemoglobin between experimental and control group
- To find out the association between the haemoglobin level and selected demographic variables in experimental and control group

HYPOTHESIS

H_1 : There will be significant difference between the level of haemoglobin before and after the administration of beetroot extract among adolescent girls.

H_2 : There will be significant association between the demographic variables and the level of haemoglobin before and after the administration of beetroot extract among adolescent girls.

H_3 : There will be significant association between the clinical variables and level of haemoglobin before and after the administration of beetroot extract among adolescent girls.

OPERATIONAL DEFINITIONS

Effectiveness

It refers to the increase in serum haemoglobin level after administering beetroot extract for a period of 20 days.

Iron deficiency Anemia

It refers to a reduction of the serum haemoglobin level between the ranges of 7gm/dl to 12 gm/dl in healthy adolescent girls.

Adolescent girls

In this study, adolescent girls refer to the females belonging to the age group of 13-17 years.

Beetroot Extract

Beetroot extract is prepared by cutting a fresh beetroot into small pieces which are blended well. 50 ml of pulp diluted in 50 ml of boiled cool water and add 15 grams of jaggery.

ASSUMPTIONS

- Most of the adolescent girls are anemic.
- Increased iron absorption is reflected with an increase in haemoglobin level.
- Anemia is preventable and treatable.
- Nurses play a major role in correction of anemia.

DELIMITATIONS

- The study will be conducted among adolescent girls who are studying in a selected school at Kanyakumari.
- The study will be limited to girls in the age group of 13 – 17 years.
- The girls who are studying 8^{th} standard to 11^{th} standard.
- The girls who attained menarche.

PROJECTED OUTCOME

Beetroot extract upon iron deficiency anaemia will have effectiveness in improving the hemoglobin level in adolescent girls.

CHAPTER II

REVIEW OF LITERATURE

Review of literature is an essential component of the research process. It is critical examination of a publication related to a topic of interest. Review should be comprehensive and evaluative. Review of literature helps to plan and conduct the study in a systematic manner.

This chapter deals with the review of published research studies and form related material for the present study .The review helped the investigator to develop an insight into the problem area. This helped the investigator in building the foundation of the study.

Review of literature helps the researcher to build on existing work he/ she should understand what is already known in the topic (Polit and Hungler 2007)

For the present study literature is reviewed and organized, under two broad headings.

- Studies related to prevalence of anemia among adolescent girls.
- Studies related to the effectiveness of beetroot extract upon anemia.

Studies related to prevalence of anemia among adolescent girl

Dr. N. Gayathri Priya .et.al(2013) conducted a true experimental study to assess the effectiveness of beet root juice on hemoglobin among adolescent girls. The objective of the study was to assess the effectiveness of beetroot juice on hemoglobin among adolescent girls. True experimental study design was adopted and the study conducted in Aringar Anna Government Higher Secondary School, Chennai, Tamilnadu. A total of 60 adolescent girls were selected for the study, in that 30 girls were in experimental and 30 girls were in the control group who fulfilled the inclusive criteria were selected by using simple random sampling technique. The freshly prepared beetroot juice was administered to the samples for

20 days in mid morning. Pre and post assessment was done using the checklist for assessing the signs and symptoms of anemia and cyanmethemoglobin method for checking hemoglobin level.The data analysis was done by using descriptive and inferential statistics.Samples in the experimental group showed a highly significant improvement in hemoglobin level following the administration of beetroot juice ($p<0.001$), in comparison with the control group. The findings unfolded that the overall posttest mean score of haemoglobin in the study group was 12.67 with SD of 0.99 and the overall posttest mean score of haemoglobin in the control group was 10.14 with SD of 0.48. It showed that after the administration of beetroot juice, there was a high significant improvement in the haemoglobin level of adolescent girls with a „t" value of 12.633 at p=0.001

Kokore BA et al (2013) conducted a quasi experimental study to determine the prevalence of anemia in a school population of 310 children (172 girls and 138 boys) aged 5 to 11years from three municipalities of Abidjan. Hematological parameters and the electrophoretic profile of hemoglobin were done for all the children. The results of study revealed that 82.9 % of children indicated that at least a parameter of the blood count was abnormal. The prevalence of anemia (hemoglobin < 11.5 g/dl) was 30.3 % with 33.3 % of males and 29.1 % for 56 girls. (239/310). The prevalence of anemia in girls (87.8%) was higher than the boys (65.1%)

Biradar SS et al (2012) conducted a cross-sectional study to assess the prevalence and the severity of anemia among adolescent girls in rural areas (Vantamuri PHC which is situated 22 kilometers away from Belgaum city), and to study the association of anemia with respect to the age of the participants and their socio-economic status. Eight hundred and forty

Adolescent girls (10-19 years of age) were participated in this study. The overall prevalence of anemia was 41.1% (345 / 840), adolescent girls had varying severity of anemia, 34.6% were mildly anemic, 6.3% were moderately anemic and only 0.2% (2) were severely anemic. The prevalence of anemia among the girls who belonged to class III was 4.1%, whereas it was 43.1% in girls of class IV and 100% in girls of class V. This was found to be statistically significant. The

prevalence of anemia among the late adolescents was 60%, whereas; it was 38.9% among the early adolescents. This was found to be statistically significant.

S.C. Jai prabhakar et al (2009) conducted an experimental study indicated that 77.7 % of 175 Jenukuruba Primitive Tribal Children (6 to 10 years) of Mysore District,Karnataka were suffering from anemia. The study revealed that, 36.57% ofchildren were moderately anemic, 26.29 per cent were mildly anemic and14.86 percent severely anemic. Their study indicates that prevalence of anemia was significantly higher in girls when compared to boys, (Girls 83.33% and Boys 70.89%).

Gupta N et al (2009) assessed the Pervasiveness of anemia in adolescent girls of low socio-economic group of the district of Kurukshetra (Haryana) India. 110 girl students (13-16 years) who were studying in VIII, IX, X, XI class of Kurukshetra of Haryana were participated in this study. It was found that out of one hundred ten girls, only 20 (18.19 %)subjects were non anemic and remaining 90 (81.81 %) subjects were suffering from various degree of anemia and their hemoglobin level ranges between 6.6g/dl to 11.0 g/dl, among the anemic subjects, 20 % had mild, 73.33 % had moderate and 6.67 % of subjects had severe degree of anemia. Prevalence of anemia was found lower in nuclear families than joint families. Further, size of family also affect, higher the number of members in the family, higher the prevalence of anemia. As both quality and quantity of food consumption get affected by number of members in family especially with limited income sources.

Chaudhary SM et al (2008) conducted a study to found 35.1% anemia prevalence among 296 adolescent females (10 to 19 years old) in the urban area of Nagpur (India), of which 69.2 % had mild anemia, 30.8% moderate anemia and non of the girls had severe anemia. They found significant association between anemia and the socio – economic status of girls, their parents' literacy.

Choudary et al., (2007) conducted a cross sectional study to assess anemia among unmarried adolescent girls in South India, 100 adolescent girls, aged from 11 to 18 years were selected as samples by purposive sampling method. Blood samples were collected and haemoglobin test was done. The result showed that

29% of adolescent girls were affected with severe anemia, rest of them had mild anemia 71% (P<0.05). Anemia has a significant association with low socio economic status, religion and reporting of infrequent or non-consumption of meat. He concluded that the haemoglobinstatus of the adolescent girls need to be improved through dietary modification along with the iron supplements and nutritional education.

Dreyfuss et al., (2007) conducted an analytical study to assess the anemia among Indian adolescent girls under the project by Health and Family Welfare Bureau. Blood collection was done and serum ferritin, peripheral blood smear and Haemoglobin test were done and analysis was carried out. The result showed that in India severe anemia ranges from 1.6% to 11.7% among adolescent girls, moderate anemia seen in rural area were more (38%) than in urban (11.9%) area (P< 0.05). He concluded that the adolescent girls are vulnerable to iron deficiency anemia, which interferes in their physical capacity and work performance. Adolescent period is the preparatory period for the physical development for the future mothers. The young reproductive age group women are more susceptible to anemia, because of their poor dietary intake.

Rohini et al., (2007) conducted are a retrospective study to assess the prevalence of anemia among adolescent girls in 16 slums at Pune. 1142 Adolescents were selected as samples. Data collection was done based on bio physiological measures, dietary history morbidity history, anthropometric measures, mental history, frequency of lemon consumption with meals, consumption of locally available iron rich foods. The result showed that 1.3% of girls were severely anemic and 58% of girls were moderately anemic (P< 0.01) in the study population.

Sunitha et al., (2007) conducted a descriptive study to assess the prevalence of anemia among adolescent girls in Jhirli. Random sampling technique was used and 105 school going adolescents were selected as samples. Blood samples were collected and analyzed and a record of one-week dietary recall was maintained. The result showed that 82% of girls were anemic based on their dietary intake (P= 0.15). The report was concluded that anemia is an

emerging problem among the world population; nearly 2000 million adolescent girls are suffering from this iron deficiency anemia.

Bulliyy et al (2007) conducted an experimental study in three districts of Orissa. Found that out of 296 adolescent girls, 96.5% among non school going adolescent girls were anemic. Of which 45.2%, 46.9% and 4.4% had mild, moderate and severe anemia respectively. They also found that significant association between hemoglobin concentration and the educational level of girls, their parent's family income and body mass index.

Suman.k et.al (2006) conducted a cross sectional study to screen out the health pattern of the adolescent girls in the age group of 10-14 years. A total of 110 healthy adolescents were taken as samples by random sampling technique. Diet survey and serum haemoglobin level were assessed. The result showed that less than 10% of the girls had 12gm/dl of haemoglobin and others were anemic with haemoglobin level in the range of 6 to 11.9 gm/dl ($p<0.05$). The report concluded that the daily food allowance for adolescent girls were inadequate for which the amount of iron and vitamins should be increased.

Sabita, et.al.(2006) conducted a descriptive study to assess the prevalence rate of anemia among school going adolescents at Jabalpur. Samples of 183 adolescents were taken from the age group of 12 to 18 years. The estimation of haemoglobin was done by cyanmethaemoglobin method and serum Ferritin was estimated. The overall prevalence of anemia was significantly higher among the girls (23.9%) when compared to boys (3.75%). Anemia was observed more among rural (25.4%) adolescents than urban (14.2%) adolescents. There was a deficiency of 81.7% and 41.6% of serum Ferritin among adolescent girls and boys respectively.

Nandita, et.al (2006)conducted a descriptive study to assess the prevalence of anemia and impact of anemia control programme among adolescent girls for which 512 school going adolescent girls were selected. The result showed that the prevalence of anemia in adolescent girls to be 80.6%. Dietary intake of the adolescent girls revealed that there was an inadequate intake of food. Almost 90.9% of adolescent girls were consuming less than 50% of required

dietary allowance, the finding showed that there was a high prevalence of anemia among the study population (P< 0.001) due to inadequate intake of food and there by a poor dietary intake of iron.

Pawashe (2006) conducted a study regarding iron nutritional status of adolescent girls belonging to an urban slum and rural areas. Overall anemia was observed in 25% of the girls irrespective of their residence. A higher percentage of rural girls (37.5%) especially below the age of 12 years showed evidence of anemia. Thereafter, the prevalence was similar in both urban and rural girls who had not attained menarche. With increasing age, urban girls who had attained menarche showed an increase in the prevalence of anemia. The prevalence of iron deficiency (serum ferritin < 12 mcg /dl) showed a progressive increase from 28% to 60% over 12 years especially in the girls (P= 0.03). Findings suggested that distribution of iron and folate tablets to correct anemia to the vulnerable groups is essential.

Karur .S et al (2006) conducted a cross sectional study to investigate the epidemiological correlation of nutritional anemia among adolescent girls (13 to 19 years) in rural Wardha.The prevalence of anemia was found to be 59.8%. In univariate analysis, lowsocioeconomic status, low iron intake, vegetarian diet, history of worminfestation and history of excessive menstrual bleeding showed significantassociation with anemia. While Multivariate logistic regression analysis suggested that strongest predictor of anemia was vegetarian diet followed by history of excessive menstrual bleeding, iron intake <14mg followed by 14-49 20mg and history of worm infestation. However age, education, socioeconomic status, BMI and status of menarche did not contribute significantly.

R.Gawarika, et al (2006) conducted a study to find out the prevalence of anemia in adolescent girls, aged 10.5 to 18 years in Ujjain city,in western Madhya Pradesh, belonging to different economic groups. Theresults revealed that the overall prevalence of anemia was 96.5%. Theprevalence of severe anemia was 11.0% in weaker income group and 2.63%among middle income group. The prevalence of severe anemia was high in girls above 14 years of age than girls below 14 years of age. The severe anemia was high (13.49%) among girls above 14 years of age in weakereconomic group but it was 4.23% among below 14 years

of age. The association was significant between the age of the adolescent girls and the prevalence of anemia.

Studies related to the effectiveness of beetroot extract upon anemia

Jagadeesh, (2010) conducted a pre experimental study to assess the effectiveness of beetroot extract on anemia among adolescent girls at selected school Mysore. 60 samples were selected between the age group of 14 and 16 years by convenience sampling technique. Levels of anemia were assessed by clinical, physiological signs and symptoms before and after administration of intervention. Beetroot juice was administered (100ml) for 20 days. After that post test was assessed there was a significant improvement in the hemoglobin level (82%) p< 0.01)

Sherin Nithya.S,(2009)conducted a pre experimental study to assess the effectiveness of beetroot extract on anemia among adolescent girls. 60 samples were selected between the age group of 13 and 17 years by using purposive sampling technique. Information was obtained by demographic proforma, clinical variables, checklist for signs and symptoms of anemia, structured questionnaire and satisfactory scale for the administration of beetroot extract. Before the administrations of beetroot extract many of them (43.3%) were moderately anemic and (55%) had mild degree of signs and symptoms of anemia, whereas after the administration of beetroot extract (38.30%) of the girls had mild anemic and majority of them (98.8%) had mild degree of signs and symptoms. The level of hemoglobin before the administration of beetroot extract among adolescent girls were low (M= 9.317, SD=1.25) and after the administration of beetroot extract it got increased (M=1.04, SD=1.40). The difference was significantly proven at p< 0.001 level

Davies et al., (2006) conducted an experimental study on beetroot juice consumption in reducing anemia among adolescent girls in U.S.A. Study was designed to show that beetroot juice increases the blood forming qualities. Due to its higher concentration of iron, it regenerates and reactivates the red blood cells.

One serving of beetroot juice (100ml) was given for 20 days, to the experimental group. After 20 days of beetroot juice intake, there was a significant improvement in the haemoglobin level (82%) for the experimental group (P<0.001).

Winson, (2005) conducted a correlation study on the effectiveness of uncooked beetroot's iron content and absorption compared with the synthetic iron content absorption. The study revealed that along with every iron rich food it is essential to take vitamin 'c' for rapid absorption. Hence in beetroot vitamin 'c' components are already present. Compared with synthetic iron content absorption (r = 0.032), uncooked beetroot has natural source of iron and vitamin 'c' has faster absorption (r = 0.42). So the absorption of iron in beetroot is easier to get absorbed than the synthetic iron contents

Jeminar, (2003) conducted an experimental study to assess the effectiveness of Beetroot extract upon anemia in Vahington. In which 105 adolescents were selected as samples by random sampling method and Blood samples were collected from them, before and after the intervention. Beetroot extract was given once in a day for 25 days. The result showed that 76% of adolescents were anemic before the treatment. There was significant improvement in the haemoglobin level (82%) of the study population (P=0.05). He concluded that vegetarians are at higher risk of developing iron deficiency anemia than non-vegetarians. Vegetarians have to take higher quality of iron rich foods in higher quantity and beetroot has a significant positive impact on the iron storage in the human body .

Milkan (2003) Conducted a hematological studies in Venesulla. There were 53 anemic girls selected as samples. Blood samples were taken and analysis was done before and after the intervention with beetroot juice administration, to know the effectiveness of beetroot in anemia correction. The result showed that 79% of the haemoglobin level has increased after therapy in the girls (P= 0.001). He concluded that beetroot has an effect on anemia.

Fsaumi, (2003) conducted an experimental study among 20 malnourished adolescent girls in the age group of 12 – 16 years who were divided into two groups, 10 as experimental and 10 as control. The girls of the experimental group

were given nutritional supplement beetroot (50gm | day) for a period of 25 days and the control group was given placebo for the same period. Diet pattern was same for all the 20 subjects. Result showed that there was an increase in the serum haemoglobin level (72%) and folic acid (68%) level in the experimental group after the administration of beetroot supplementation (m=10.31, SD=1.32146) irrespective of their demographic variables. It is concluded that the increase in serum haemoglobin levels irrespective of their demographic variables in the experimental group as compared to control group was definitely due to the effect of beetroot supplementation.

Fritz et al., (2002) conducted an experimental study to assess the effectiveness of beetroot juice in anemia correction in Indonesia 105 school children with iron deficiency anemia were selected, aged from 6-11 years, experimental and control groups were allocated by random sampling method. Beetroot juice (100 ml) was given by oral upto 20 days. Haemoglobin level was checked at pre and post intervention. There was significant improvement in the haemoglobin level (79.72%) of the samples ($p < 0.001$) than the control group ($p < 0.05$). He concluded that the intake of beetroot juice has significant character in reducing the prevalence of iron deficiency in children.

CONCEPTUAL FRAMEWORK

THEORY APPLICATION

HEALTH PROMOTION MODEL

Conceptual frame work is defined as a theoretical approach to the study of the problems that are scientifically based, which emphasizes the selection arrangements and classification of its concept.

A conceptual model gives a clear picture for logical thinking for systematic observation and interpreting the observed data. The model also gives direction for relevant question on phenomenon and point out solution to practical problems.

A conceptual model frame work deals with the concepts of the research problem assembled together that provide a certain frame of reference. The frame work helps and guides the researcher to gain insight into the problems by explaining the relationship between the facts .

One of the important purposes of theoretical framework is to communicate clearly the relationship of various concepts . Theoretical framework of reference for clinical practice, research and education.

The theoretical frame work for the present study is developed from health promotion model to Pender's health promotion is directed towards the increasing level of wellbeing and actualizing the health potentials of all the individuals.

In the present study the concept of Pender's health promotion model utilized were the adolescent girls act as agents with their knowledge

regarding anemia. Determinants of health promoting behavior organized into cognitive-perceptual factors, modifying factors participation and the likelihood of being engaged in health promoting behavior which depends on cues of action, such as health messages and beetroot extract.

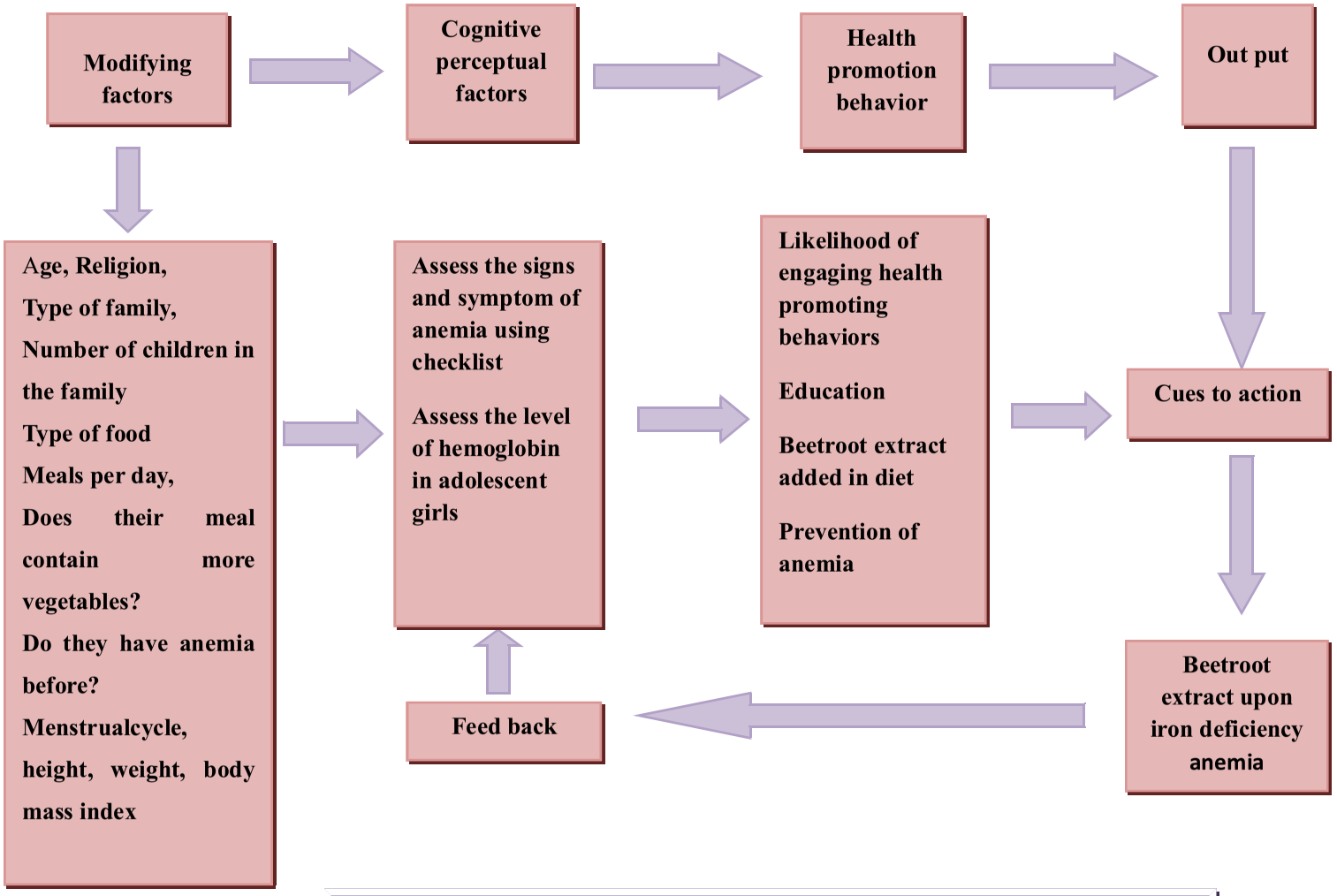
Cognitive perceptual factors;-These are the primary motivational mechanisms for the activities related to health promotion like the importance of health, the perceived control of health, self efficiency, perceived health benefits and barriers of promotion which are reflected by assessing their knowledge through the structured interview scheduled regarding anemia.

Modifying factors:-These are demographic variables of age, religion,type of family, , number of children in the family,type of food,meals per day, does their meal contain more vegetables, do they have anemia before, if yes , are they taking any treatment, menstrual cycle, height, weight, body mass index which influence the adolescent girls in health promoting behavior.

Participation in health behavior:-The model represents the inter relationship between cognitive perceptual factor and modifying factors influencing the occurrence of health promoting behavior of the adolescent girls and likelihood of maintaining health.

Cues to action:- Further the investigation has planned and administered beetroot extract on iron deficiency anemia which has a cue to action, which in turn will help in the promotion of health and prevention of complication of in later adulthood .

CONCEPTUAL FRAMEWORK



1. PENDER'S MODIFIED HEALTH PROMOTION

CHAPTER – III

RESEARCH METHODOLOGY

This chapter deals with the methodological approach adopted for the study .It includes description of research approach, research design, variables , setting of the study, population and sample criteria for sample selection , sampling technique, description of the tool, scoring procedure ,content validity of the tool , pilot study, data collection procedure ,plan for the data analysis and protection of human rights..

According to Polit and Hungler, Research methodology refers to the research ways of obtaining, organizing and analyzing data.

RESEARCH APPROACH

Research approach is the most significant part of any research. The appropriate choice of the research approach depends upon the purpose of the research study which has been undertaken in order to accomplish the main objectives of the study.

An experimental research approach, a sub type of quantitative approach is used to determine the effectiveness of beetroot extract upon iron deficiency anemia among adolescent girls

RESEARCH DESIGN

Research design refers to the researchers overall plan for obtaining answers to the research questions and it spells out the strategies that the researcher adopts to develop information that is adequate, accurate, objective and interpretable (Polit and Hungler.1999)

In this study Quasi-experimental pre-test post-test design, is adopted for conducting the study.

The research design is represented diagrammatically as follows

Group	Pretest	Intervention	Posttest
Experimental	O_1	X	O_3
Control	O_2	-------	O_4

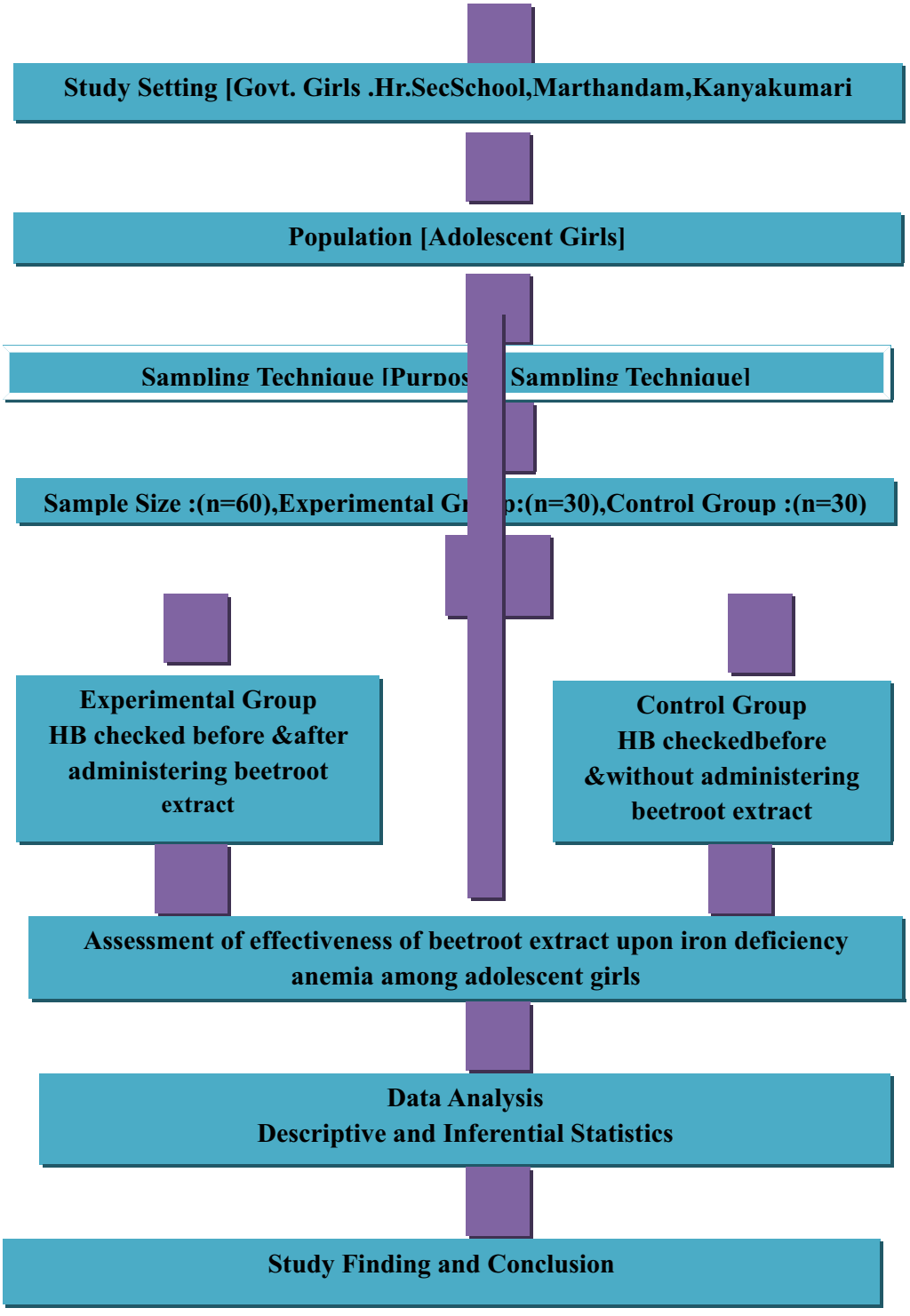
O_1-Pretest assessment of hemoglobin in experimental group

O_2- Pretest assessment of hemoglobin in control group

O_3- Posttest assessment of hemoglobin in experimental group

O_4- Posttest assessment of hemoglobin in control group

X - Administration of beetroot extract in the experimental group



1.OVERALL VIEW OF RESEARCH METHODOLOGY

VARIABLES

A variable is measurable or potentially components of an object or event that may be different from quality and quantity from a one individual ,object or event to another individual object or event to same general class.

Independent variable

The independent variable is a stimulus or activity that is manipulated or varied by the researcher to create an effect on the dependent variable.

In this present study independent variable is Beetroot extract

Dependent variable

A dependent variable is response behavior or outcome the researcher wants to predict or explain. In this present study, dependent variable is increase in hemoglobin of adolescent girls.

Influencing variables

Background variables which consists of age, religion,type of family , number of children in the family,type of food,meals per day, does their meal contain more vegetables, do they have anemia before, if yes , are they taking any treatment, menstrual cycle, height, weight, body mass index.

SETTING OF THE STUDY

Polit and Hungler (2001) Physical location and condition in which data collection has taken place are the setting of the study.

The study was conducted in government girls higher secondary school, marthandamkanyakumari

POPULATION

According to Polit&Hungler (2005) Population refers to the totality or aggregate of all individuals with the specified characteristics.

In the present study, the accessible population was school children of 13-17 years girls who are willing to participate in the study in government girls higher secondary schoolMarthandamKanyakumari.

SAMPLE

Polit&Hungler defines sample as the subset of the population selected to participate in the research study.

The sample selected for the present study is 60 school children who were in VIII-XI standard of govt. girls higher secondary school. Out of them, 30 were selected for experimental and 30 for control group.

SAMPLING CRITERIA

The following were the inclusive and exclusive criteria for selection of the sample

Inclusion criteria

The study include girls who are

- In the age group of 13-17 years.
- Interested to participate in the study.
- With the haemoglobin levels less than 12 gm%.
- Attained menarche.

Exclusion criteria

The study excludes girls

- With any systemic disease/associated illness.
- With history of menorrhogia/ metrorrhoea.

SAMPLING TECHNIQUE

Polit and Hungler (2001) state that the process of selecting a portion of population is to represent the entire population.

The samples for this study were selected by adopting non-probability purposive sampling technique. The investigator has chosen the sample by using the Inclusion and Exclusion criteria and identified 60 school children between 13-17years.

DESCRIPTION OF TOOL

A data collection instrument is a formal document used to collect and record information such as questionnaire (Polit and Hungler1995).

The study is aimed at evaluating the effectiveness of beetroot extract upon anemia. Data collection instruments and related information are

- Background variable
- check list for signs and symptoms of anemia
- Clinicalproforma used to measure the haemoglobin level by using cyanmethemoglobin.

Scoring Procedure

Section I - Background variables which consists of age, religion,type of family,family income per month, number of children in the family, type of food, meals per day, does their meal contain more vegetables, do they have anemia before, if yes , are they taking any treatment, menstrual cycle, height, weight, body mass index

Section II - Clinical symptom checklist consisted of ten items with a single answer. Scoring "2" was given when the clinical symptoms were always present, scoring "1" was given when the clinical symptoms were occasionally present and scoring "0" was given when the clinical symptoms was never present. Total score of the items was "20". Maximum

score was 20 and minimum score was 0. And the score interpretation was mild anemia (1-7), moderate anemia (8-14) and severe anemia (15-20).

1] Feel tired or weak more often than usual

2] Lightheadedness when you stand

3] Feeling grumpy

4] Sore tongue

5] Experienced shortness of breath

6] Headache

7] Very heavy menstrual flow

8] Dry nails

9] Pallor complexion

10] Fatigue

Section III Haemoglobin level classified as per WHO criteria

- 12gm% -Normal (excluded)
- 10-11.9gm%- Mild anemia
- 7-9.9gm%-Moderate anemia
- <7gm%-Severe anemia (excluded)

TESTING OF THE TOOL

Content validity

According to Nancy Burns (2005) "Validity is the determination of the extent to which an instrument reflects the abstract construct being examined.

Content validity of the tool was obtained on the basis of opinion from many experts comprising of 5 nursing experts, two nutritionist and two physician .Minor modifications are made on the basis of recommendations and suggestions of experts. After consulting the guide and co guide, final tool was reframed .It was found to be valid and suitable for adolescent girls

Validity and reliability of the tool

The validity of the tool was established in consultation with nursing experts, nutritionist, paediatrician, obstetrics &gynaecologist, biochemistry, biostatistician .The reliability was established by inter-rater method to assess the internal consistency of the test. The reliability score was r=0.96.The reliability of the Cyanmethemoglobin (CMG) method was checked in two different laboratories to check the consistency of the test.

PILOT STUDY

Polit and Beck (2004) states pilot study is a small version or trail run, done in preparation for a major study.

The pilot study was conducted among a sample of 6 adolescent girls, selected by purposive sampling technique the feasibility and practicability of the study was assessed. No unforeseen problem was accounted during the pilot study. The familiarity of administering the questionnaire was gained through the pilot study. Beet root extract was administered to the experimental group. The objectives and research question were examined. The data wasanalysed using descriptive and inferential statistics.It revealed that there was a significant difference exist between the experimental and control group. It shows increase in level of hemoglobin in experimental group, thus suggesting that beet root extract was effective in increasing haemoglobin level.

DATA COLLECTION PROCEDURE

The study was conducted at Govt.girlsHr.Sec.School, marthandam, Kanyakumari, India. Written permission was obtained from authorities and oral consent was obtained from the subjects after explaining the purpose of the study. . The parents of the subjects is informed through daily dairy and permission was obtained. The sample size selected for this study consists of 60 adolescent girls of age 13-17 years who were studying VIII-XI standard and fulfilled the inclusion criteria. Background variables, clinical signs check list and clinical symptom checklist, structured questionnaire were used to collect the data from the adolescent girls. Pre and post assessment was done using the checklist for assessing the signs and symptoms of anemia and cyanmethemoglobin method for checking hemoglobin level. The beetroot juice was prepared by cutting 100gm of fresh beetroot into small pieces and grind, the beetroot extract prepared for this was mixed with 50 ml of water and 15gm of jaggery.100 ml of beetroot juice was given to each adolescent girl for 20 days in mid-morning. Collected data was coded, tabulated and analyzed by descriptive and inferential statistics.

PLAN FOR DATA ANALYSIS

The data will analyzed with the help of descriptive statistics like mean, percentage, standard deviation and inferential statistics like independent, paired 't' test and chi-square test. The association between demographic data & depend variables will be analyzed with the help of chi-square test.

PROTECTION OF HUMAN RIGHTS

The investigator got the approval from the correspondent of Government girls higher secondary school marthandam ,Kanyakumari. Written permission was obtained from authorities and oral consent was obtained from the subjects after explaining the purpose of the study. The information obtained was kept confidential.

CHAPTER - IV

DATA ANALYSIS AND INTERPRETATION OF RESULTS

This chapter deals with the analysis and interpretation of data collected from 60 school children from selected school at kanyakumari.

The present study was to evaluate the effectiveness of beetroot extract upon iron deficiency anaemia among adolescent girls.

According to Polit and Hungler (2005),"Analysis is the method of organizing sorting and scrutinizing data in such a way that research question can be answered.

The study findings are presented in the section as follows.

Section I:Demographic variables of adolescents girls in experimental and control group

Section II : Assessment of the signs and symptoms of anemia using check list

Section III : Assess the level of hemoglobin in the study group and control group

Section IV : Comparison of the effectiveness of beetroot juice on haemoglobin between experimental and control group

Section V : Association of pretest hemoglobin level with the selected demographic variables of adolescent girls among experimental and control group

Table. 1.1 Distribution of demographic variables of adolescents in experimental &control group

[N=60]

S.No	DemographicVariables	Experimental Group (n=30)		Control Group (n=30)		Total N=60	
		(n)	(%)	(n)	(%)	(N)	(%)
1	Age						
	(a) 13 -14years	3	10	6	20	9	15
	(b) 14-15 years	10	33.33	4	13.33	14	23.33
	(c) 15-16 years	16	56.6	19	66.6	35	61.7
	(d) 16-17years	1	3.33	1	3.33	2	3.33
2	Religion						
	(a) Hindu	26	86.67	27	90	53	88.33
	(b) Muslim	1	3.33	0	0	1	3.33
	(c) Christian	3	10	3	10	6	10
3	Type of family						
	(a) Joint family	5	16.7	6	20	11	18.33
	(b) Nuclear family	25	83.3	24	80	49	81.7
4	Type of food						
	(a) Vegetarian	3	10	4	13.33	7	11.7
	(b) Non-Vegetarian	27	90	26	86.67	53	88.33
5	No.of meals per day						
	(a) One	0	0	0	0	0	0
	(b) Two	7	23.33	8	26.7	15	25

	(c) Three	23	38.33	22	73.33	45	75
6	Does meals contain vegetables						
	(a) Yes	21	70	22	73.33	43	71.7
	(b) No	9	30	8	26.7	17	28.33
7	History of anemia						
	(a) Yes	0	0	0	0	0	0
	(b) No	30	100	30	100	60	100
8	Menstrual history						
	(a) Regular	26	86.6	22	73.33	48	80
	(b) Irregular	4	13.33	8	26.7	12	20

Table I.1 reveals the demographic variables of the adolescent girls

Regarding age, 3(10%) belongs to the age group of 13-14 years, 10(33.33%) belongs to the age group of 14-15 years, 16(56.6%) belongs to the age group of 15-16,1(3.33%) belongs to the age group of 16-17years in experimental group, and 6(20%) belongs to the age group of 13-14 years, 4(13.33%) belongs to the age group of 14-15 years, 19(66.6%) belongs to the age group of 15-16years1(3.33%) belongs to the age group of 16-17years, in control group.

Regarding the religion 26(86.67%) of the adolescents belongs to Hindu, 1(3.33%) of the adolescents belongs to Muslim, 3(10%) of the adolescents belongs to Christian in experimental group and 27(90%) of the adolescents belongs to Hindu, 0(0%) of the adolescents belongs to Muslim, 3(10%) of the adolescents belongs to Christian in control group.

Regarding the type of family 5(16.7%) of the adolescent girls belongs to joint family,25(83.3%) of the adolescent girls belongs to nuclear family in experimental group and 6(20%) of the adolescent girls

belongs to joint family,24(80%) of the adolescent girls belongs to nuclear family in control group.

Regarding the type of food 3(10%) of the adolescent girls are vegetarian,27(90%) of the adolescent girls are non-vegetarian in experimental group and 4(13.3%) of the adolescent girls are vegetarian, 26(86.67%) of the adolescent girls are non-vegetarian in control group .

Regarding the number of meals per day 0(0%) of the girls takes meals once a day, 7(23.33%) of the girls takes meals twice a day, 23(38.33%) of the girls takes meals thrice a day in experimental group, and 0(0%) of the girls takes meals once a day, 8(26.7%) of the girls takes meals twice a day, 22(73.33%) of the girls takes meals thrice a day in control group.

Regarding the meals containing vegetables 21(70%) of the girls consumes vegetables with meals, and 9(30%) of the girls does not consume vegetables in their meals in experimental group, and 22(73.33%) of the girls consumes vegetables with meals, and 8(26.7%) of the girls does not consume vegetables in their meals in control group.

Regarding the history of anemia 30(100%) has no history of anemia in experimental group and 30(100%) has no history of anemia in control group.

Regarding menstrual history 26(86.6%) of the adolescent girls has regular menstrual cycle, 4(13.33%) of the adolescent girls has irregular menstrual cycle and 22(73.33%) of the adolescent girls has regular menstrual cycle, 8(26.7%) of the adolescent girls has irregular menstrual cycle.

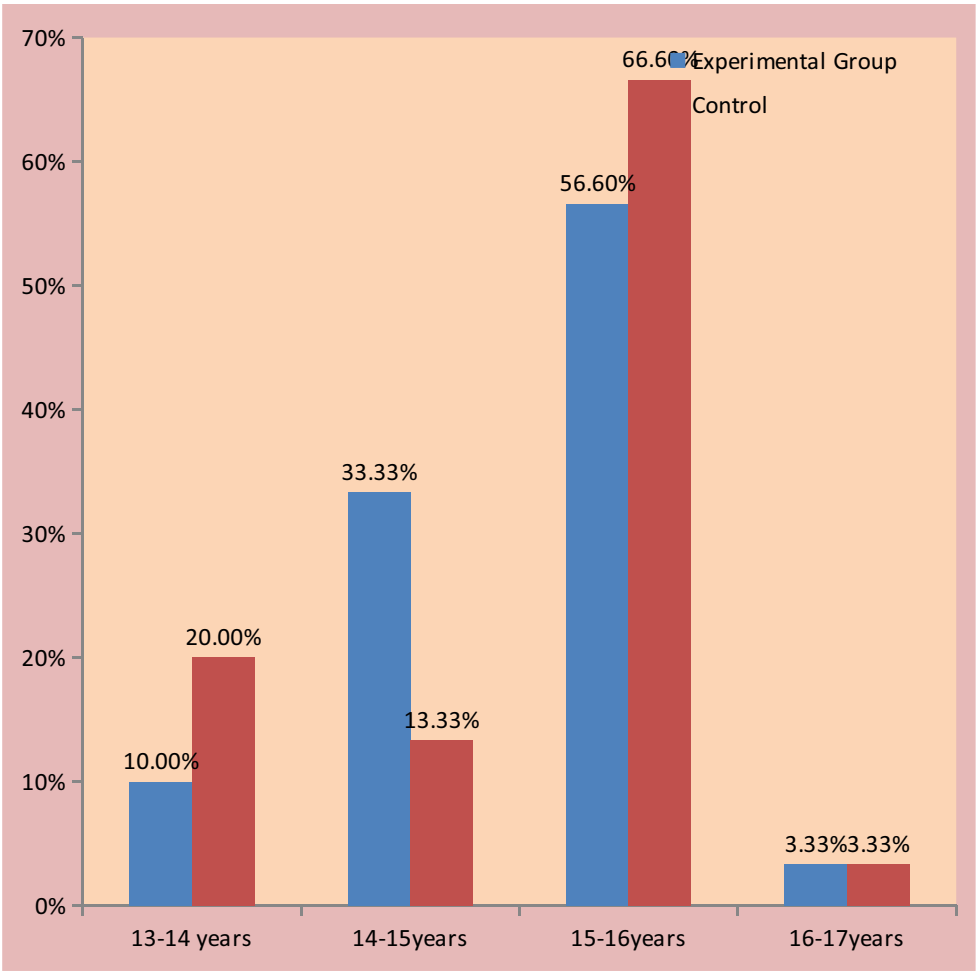


Figure 2.1 Frequency and percentage Distribution of demographic variable according to age

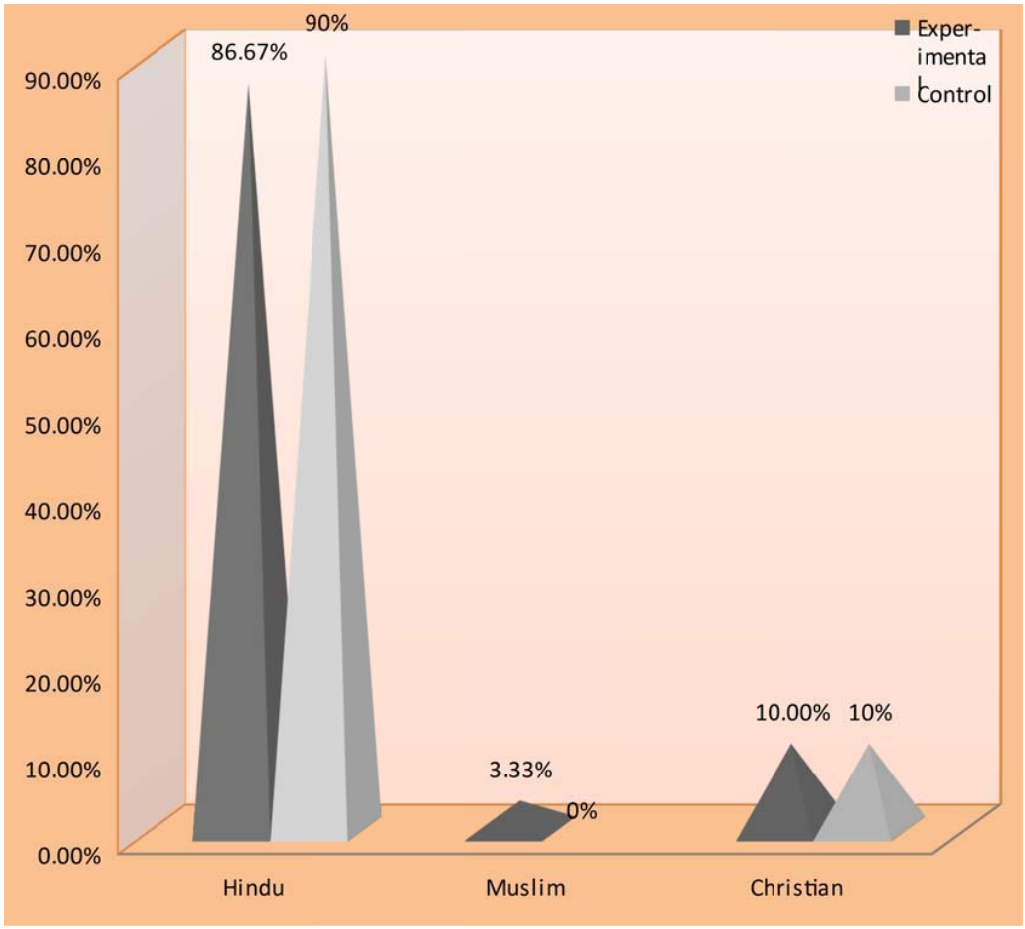


Figure 2.2 Frequency and percentage Distribution of demographic variable according to religion

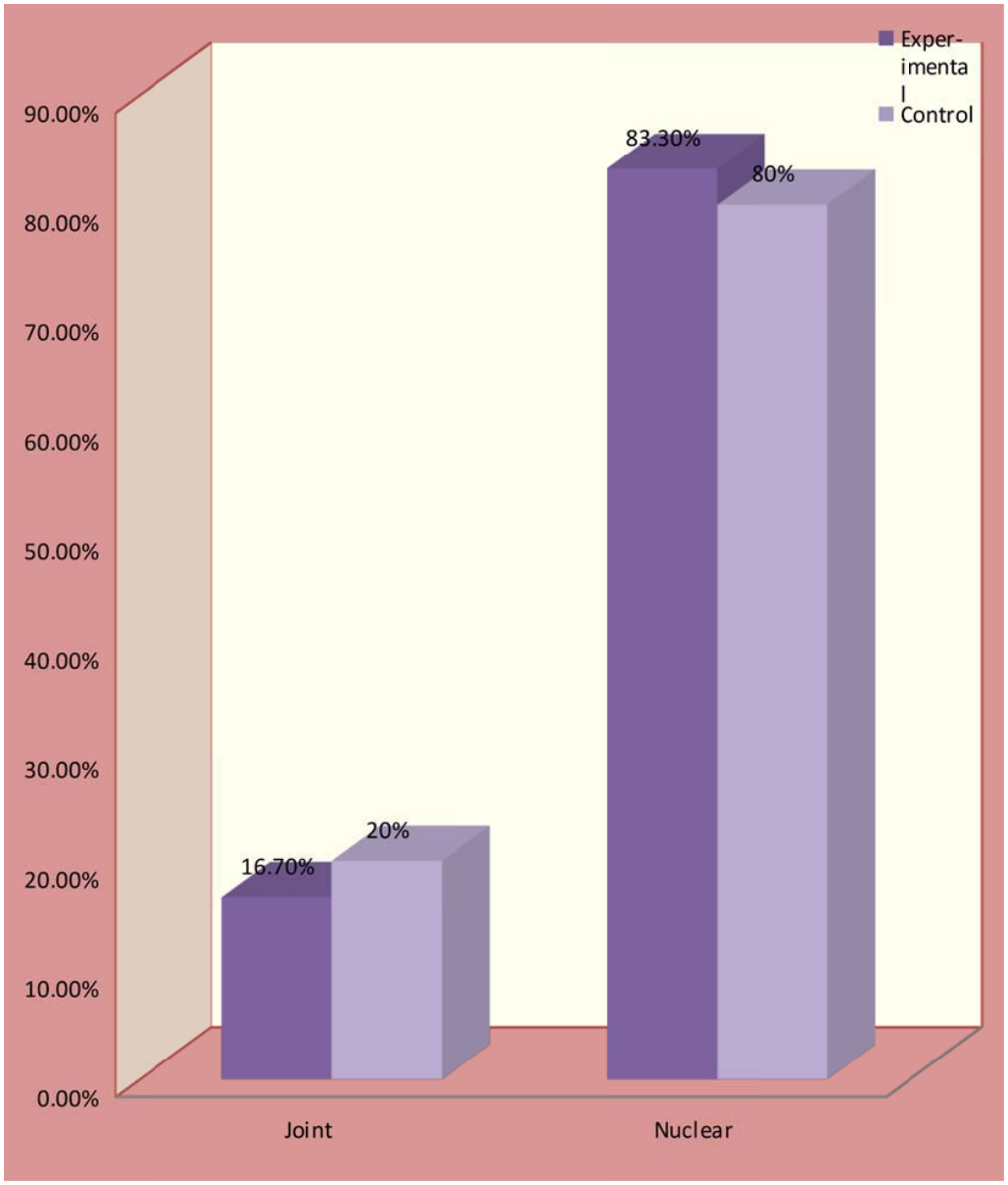

Exper-
imenta
l
Control
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
16.70%
20%
83.30%
80%
Joint
Nuclear

Fig 2.3 Frequency and percentage distribution of demographic variables according to type of family

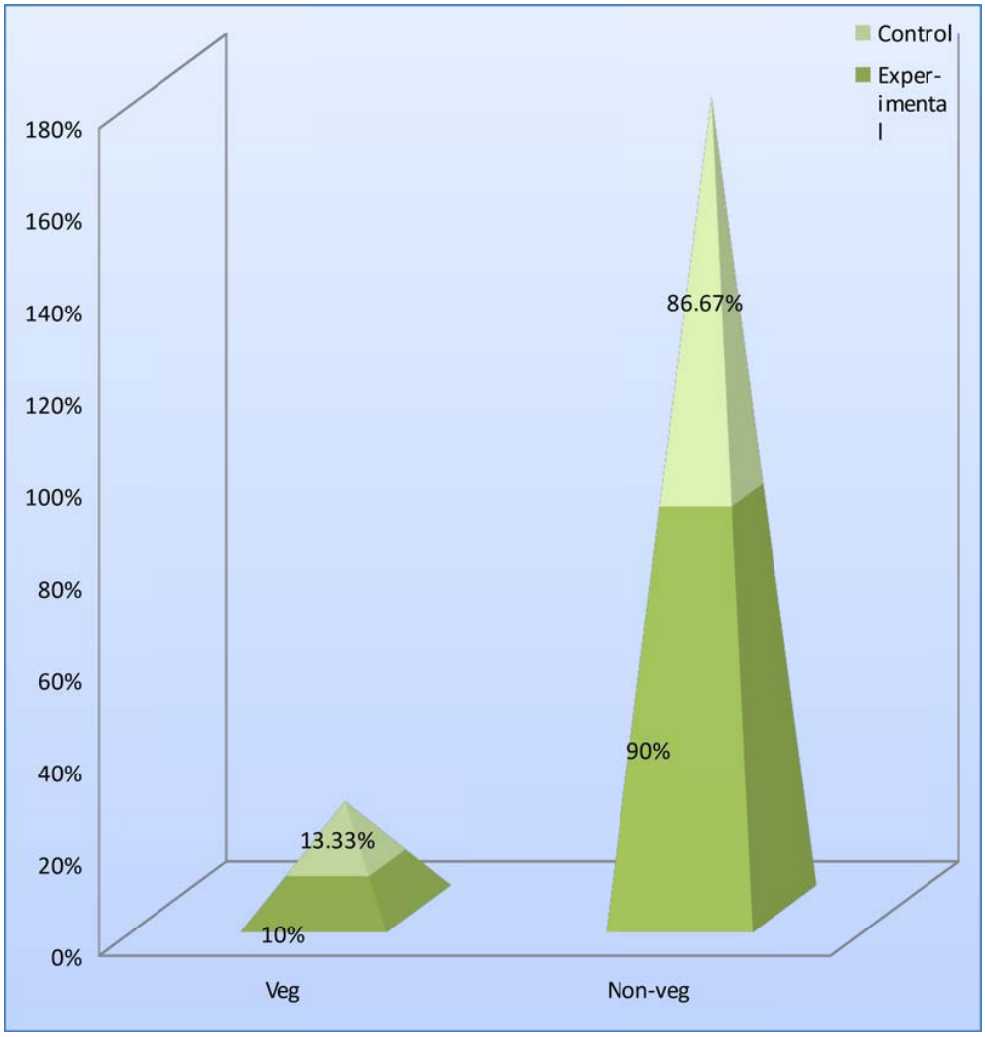


Fig 2.4 Frequency and percentage distribution of demographic variables according to type of food

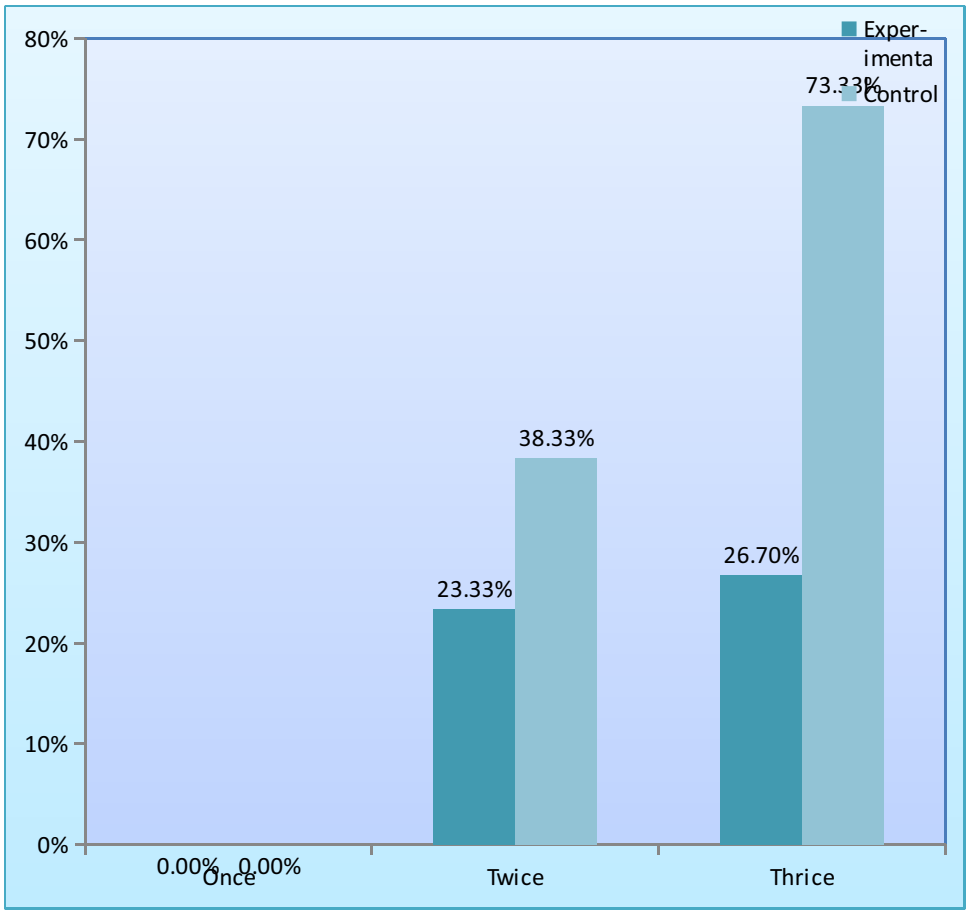


Fig 2.5 Frequency and percentage distribution of demographic variables according to no of meals

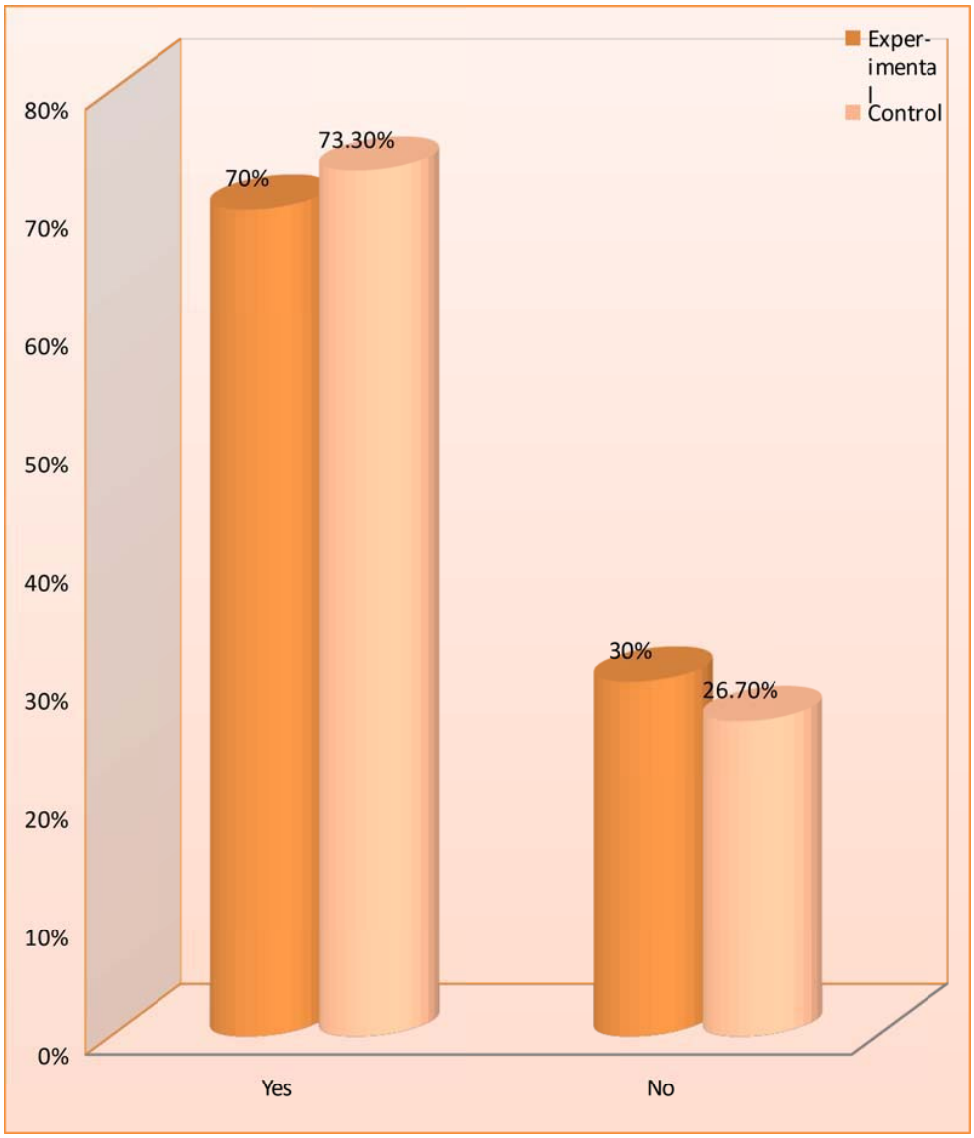

Exper-imenta l
Control
80%
70%
60%
50%
40%
30%
20%
10%
0%
70%
73.30%
30%
26.70%
Yes
No

Fig 2.6 Frequency and percentage distribution of demographic variables according to mealsContaining vegetable

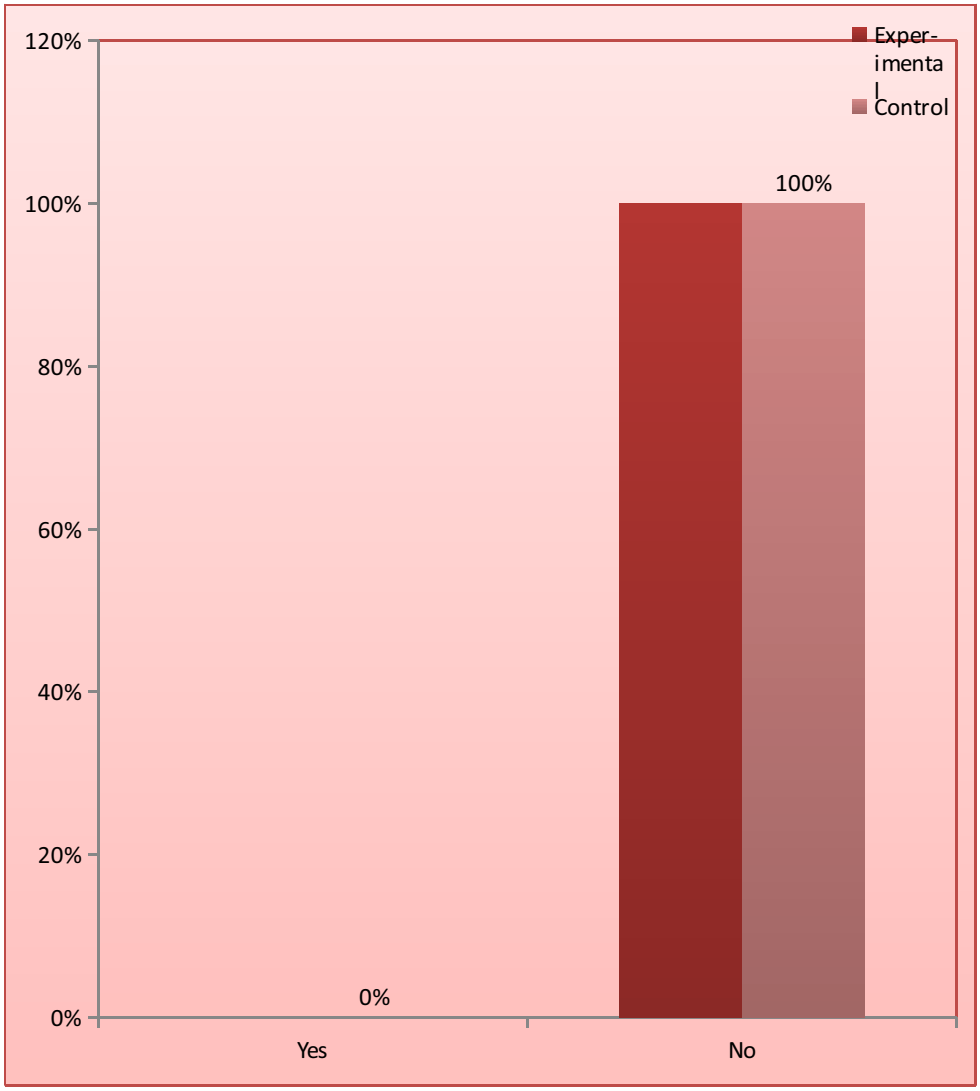


Fig 2.7 Frequency and percentage distribution of demographic variables according to history of anemia

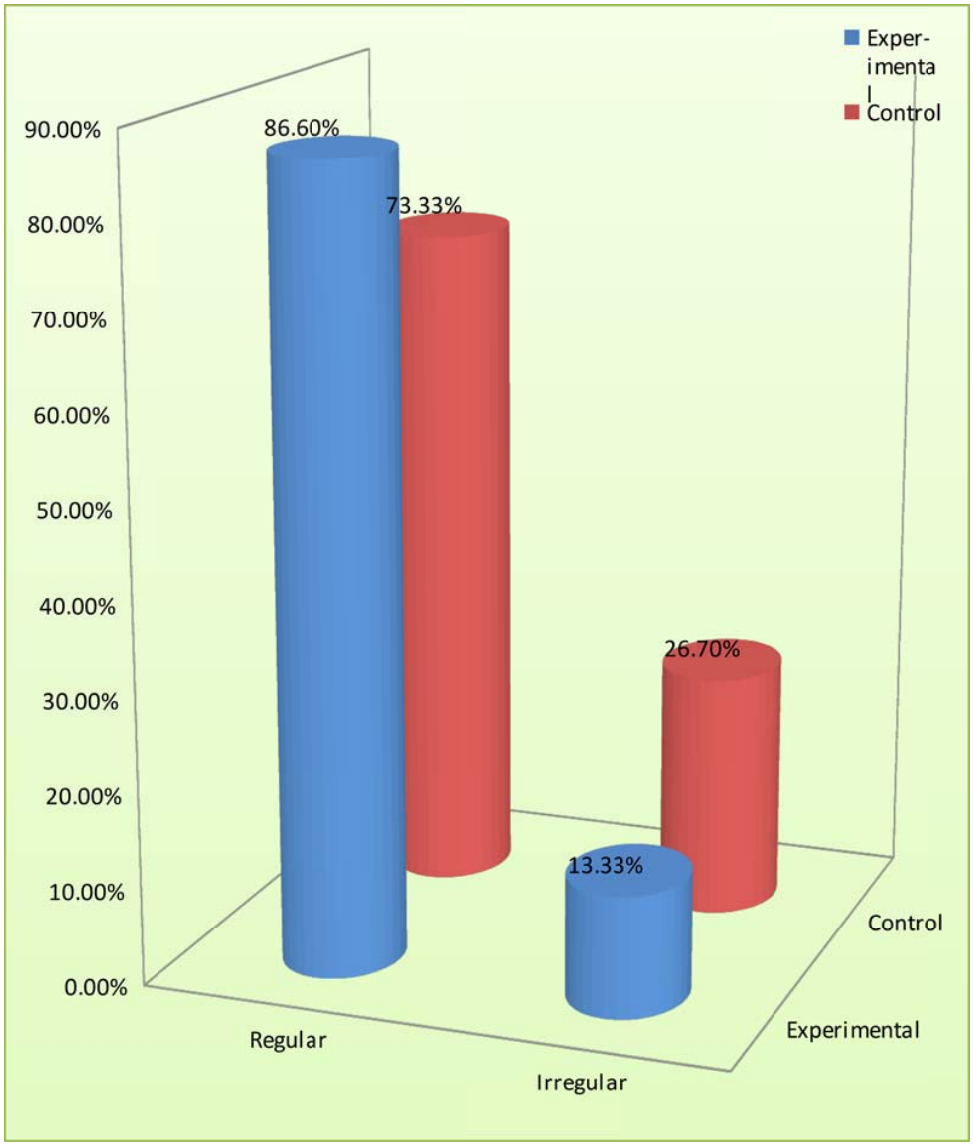


Fig 2.8 Frequency and percentage distribution of demographic variables according to history of menstrual cycle

Table 2.1 Frequency and percentage distribution of pre &post test level of clinical signs and symptoms in the experimental group and control group

(N=60)

Clinical Signs	Mild[1-3]		Moderate[4-6]		Severe[7-10]	
	n	%	n	%	n	%
Experimental Group						
Pretest	1	3.33	28	93.33	1	33.3
Posttest	29	96.67	1	3.33	0	0
Control Group						
Pretest	0	0	29	96.67	1	33.3
Posttest	0	0	30	100	0	0

Table 2.1 reveals that Clinical signs in the experimental group in the pretest 1(3.33%) has mild anemia, 28(93.33%) have moderate anemia, 1(3.3%) has severe anemia and in the posttest 29(96.6%)have mild

anemia, 1(3.33%) has moderate anemia. And in the control group, pretest 29(96.67%) have moderate anemia, 1(3.3%) has severe anemia and in the posttest 30(100%) have moderate anemia.

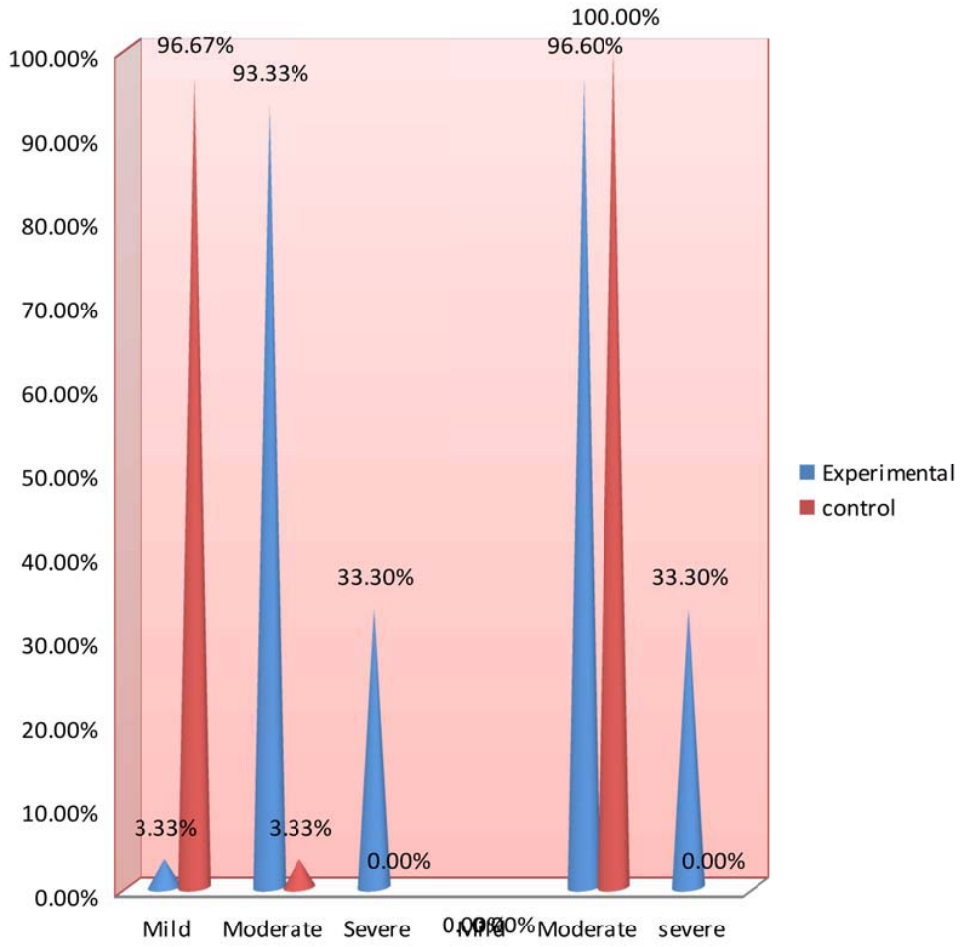


Fig 3.1 Frequency and percentage distribution of pre &post test level of clinical signs and symptoms in the experimental group and control group

Table 3.1 Frequency and percentage distribution of pre &post testlevel of hemoglobin in the experimental group and control group

[N=60]

Hemoglobin	**Normal ≥ 12gm%**		**Mild Anaemia 10-11.9gm%**		**Moderate Anaemia 9-9.9gm%**	
	n	**%**	**n**	**%**	**n**	**%**
Experimental Group						
Pretest	0	0	18	60.0	12	40.0
Posttest	27	90.0	3	10.0	0	0
Control Group						
Pretest	0	0	24	80.0	6	20.0
Posttest	0	0	25	83.33	5	16.67

Table 3.1 reveals that in the experimental group pretest haemoglobin level 18(60%) have mild anemia, 12(40%) have moderate anemia, and in the posttest haemoglobin 27(90%) have normal hemoglobin level, 3(10%) have moderate anemia. And in the control group pretest haemoglobin level 24(80%) have mild anemia, 6(20%) have moderate anemia, and in the posttest haemoglobin level 25(83.33%) have mild anemia, 5(16.67%) have moderate anemia.

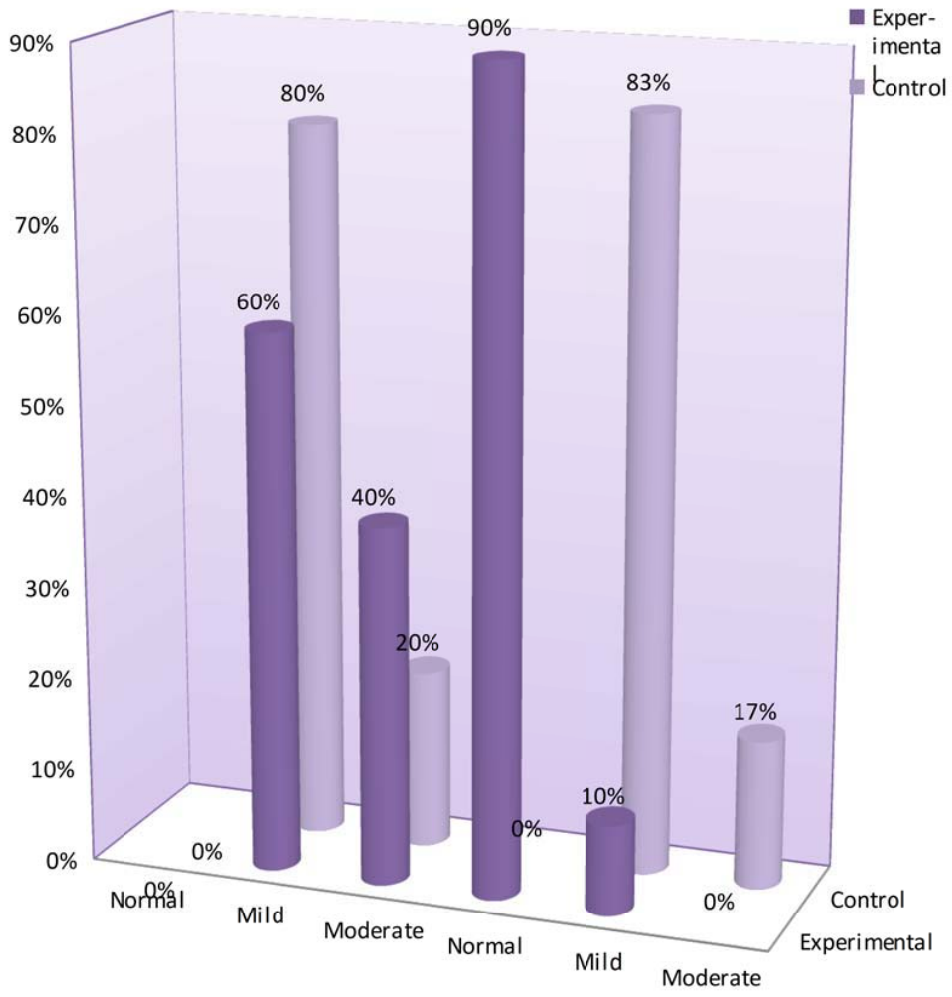


Table 3.2Frequency and percentage distribution of pre &post testlevel of hemoglobin in the experimental group and control group

Table 4.1 Comparison of pretest and posttest hemoglobin score in the expeimental and control gro (N=60)

Hemoglobin	Mean	SD	‘t ‘ value
Experimental Group			
Pretest	10.04	0.58	‘t’=17.787
Posttest	0.99	0.99	p=0.001
Control Group			
Pretest	10.14	0.49	‘t’=10.005
Posttest	10.14	0.48	p=0.996

Table 4.1 shows In the experimental group overall pretest mean score of hemoglobin was 10.04 with SD of 0.58 and the overall posttest mean score of Haemoglobin was 12.67 with SD of 0.09. It proved that after the administration of beetroot juice , there was a significant improvement in the Hemoglobin level of adolescent girls with a „t‟ value of 17.787 at $p < 0.001$.Where as in control group overall pretest mean score of Hemoglobin was 10.14 with SD of 0.49 and the overall posttest mean score Hemoglobin was 10.14 with SD of 0.48. It showed that, there was no significant improvement in the Hemoglobin level of adolescent girls.

Table 5.1 Comparison of posttest hemoglobin score between the experimental and control group

(N=30)

Hemoglobin	Mean	SD	‘t’ Value

Experimental Group	12.67	0.99	't'=12.633
Control Group	10.14	0.48	p=0.001

The findings unfolded that the overall posttest mean score of hemoglobin in the experimental group was 12.67 with SD of 0.99 and the overall posttest mean score of hemoglobin in the control group was 10.14 with SD of 0.48. It showed that after the administration of beetroot juice, there was a high significant improvement in the hemoglobin level of adolescent girls with a „t" value of 12.633 at p=0.001.

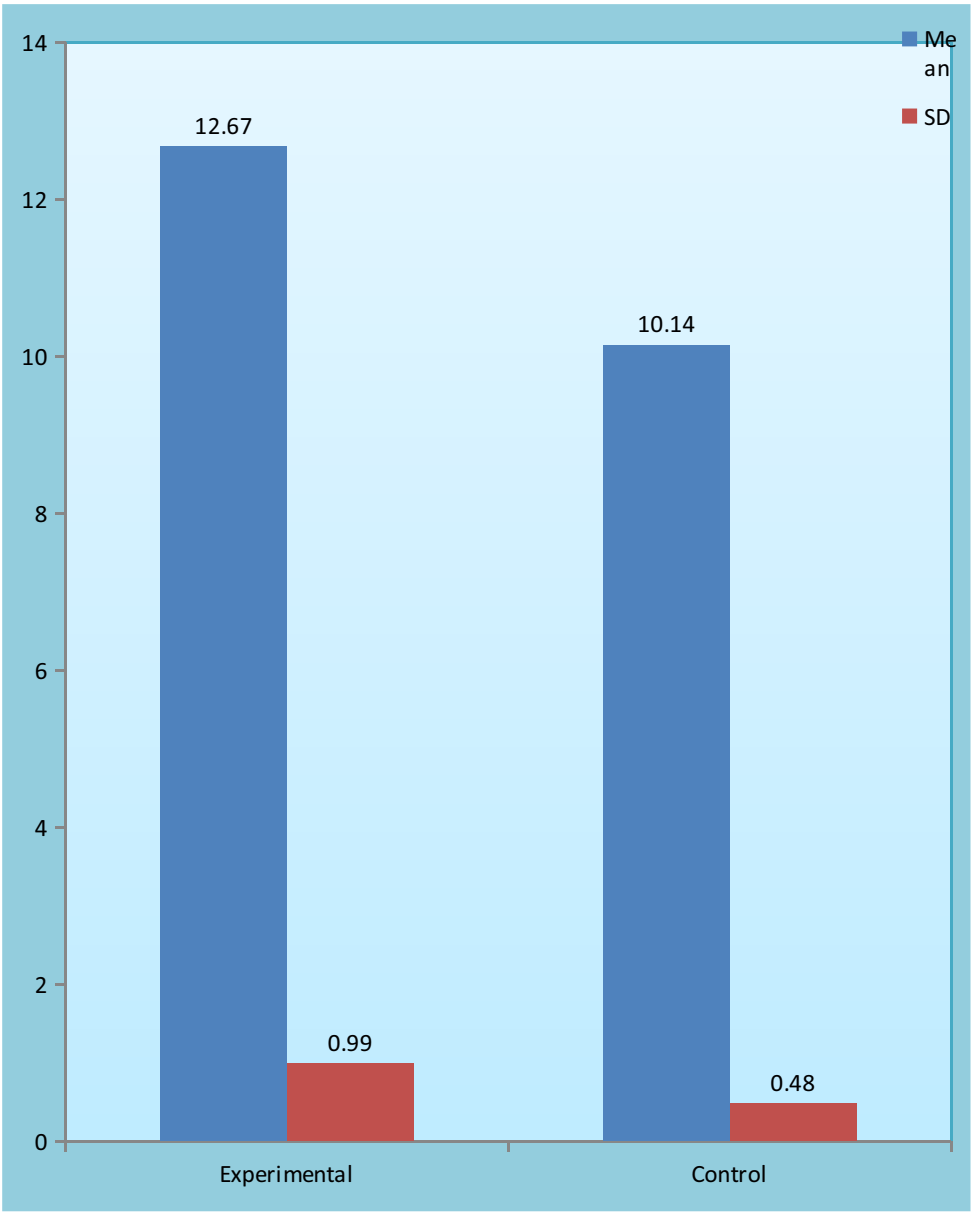


Fig 4 Percentage of posttest hemoglobin score between the experimental and control group

S.No	Demographic Variable	Above Mean	Below Mean	Chi square	Df	Level of significance

1	Age (a) 13-14 years (b) 14-15 years (c) 15-16years (d) 16-17years	 3 5 8 1	 0 5 8 0	92.78	6	S
2	Religion (a) Hindu (b) Muslim (c) Christian	 10 0 2	 16 1 1	183.09	4	S
3	Type of family (a) Joint family (b) Nuclear family	 3 20	 2 5	47.65	2	S
4	Type of food (a) Vegetarian (b)Non-Vegetarian	 3 14	 0 13	57.49	2	S

Table 6.1 Association of demographic variables with the pre test level of hemoglobin in experimental group [N=30]

S.No	Demographic Variable	Above Mean	Below Mean	Chi square	Df	Level of significance
5	No.of meals per					

	day (a) One (b) Two (c) Three	0 4 21	0 3 2	60.9	4	S
6	Does meals contain vegetables (a) Yes (b) No	20 6	1 3	63.83	4	S
7	History of anemia (a) Yes (b) No	0 15	0 15	49	2	S
8	Menstrual history (a) Regular (b) Irregular	16 2	10 2	64.8	2	S

Association revealed that the demographic variable(age in years, religion, number of children in the family, type of food, number of meals per day, does their meal contain vegetables, do they have history of anaemia,menstrual cycle,)had statistically significant association with the haemoglobin level at $p<0.001$.in experimental group.

Table 6.2 Association of demographic variables with the pre test level of hemoglobin in control group

[N=30]

S.No	Demographic Variable	Above Mean	Below Mean	Chi square χ^2	Df	Level of significance

1	Age (a)13-14 years (b)114-15 years (c)15-16 years (d)16-17years	 3 3 8 1	 3 1 10 1	89.78	6	S
2	Religion (d) Hindu (e) Muslim (f) Christian	 11 0 2	 16 0 1	167.09	4	S
3	Type of family (c) Joint family (d) Nuclear family	 3 20	 3 4	57.65	2	S
4	Type of food (a) Vegetarian (b) Non-Vegetarian	 3 14	 1 12	57.49	2	S

S.No	Demographic Variable	Above Mean	Below Mean	Chi square χ^2	df	Level of significance
5	No.of meals per day (d) One (e) Two	 0	 0			

	(f) Three	4 20	4 2	60.9	4	S
6	Does meals contain vegetables (c) Yes (d) No	20 5	2 3	73.83	4	S
7	History of anemia (c) Yes (d) No	0 15	0 15	49	2	S
8	Menstrual history (c) Regular (d) Irregular	12 5	10 3	44.8	2	S

Association revealed that the demographic variable(age in years, religion, number of children in the family, type of food, number of meals per day, does their meal contain vegetables, do they have history of anaemia,menstrual cycle,)had statistically significant association with the haemoglobin level at $p<0.001$.in control group

CHAPTER V

DISCUSSION

The aim of the present study is to assess the effectiveness of beet root extract upon iron deficiency anemia among adolescent girls in selected school at Kanyakumaridistrict .The sample size was 60, and the

samples were selected using purposive sampling technique. True experimental pretest post test design is adopted for this present study.

To first objective of the study is to assess the haemoglobin level among study and control group

The findings of the study unfolded that the overall pretest mean score of haemoglobin was 10.04 with SD of 0.58 and the overall posttest mean score of haemoglobin was 12.67 with SD of 0.99. It showed that after the administration of beetroot juice, there was a high significant improvement in the haemoglobin level of adolescent girls with a „t‟ value of 17.787 at p=0.001. (Table-IV) Hence the H1 stated earlier that „there is no significant difference between the pretest and posttest level of haemoglobin in experimental group at p=0.001 was accepted.

The findings of the study were consistent with the study conducted by SherinNithya(2009) on effectiveness of beetroot juice on hemoglobin level among 60 school children.

The second objective of the study is to determine the effectiveness of beetroot juice on haemoglobin between study and control group

The study revealed that pretest mean score of haemoglobin was 9.67 with SD OF 0.52 and the overall posttest mean score of hemoglobin was 12.87 with sd of 0.99. The findings unfolded that the overall posttest mean score of haemoglobin in the experimental group was 12.67 with SD of 0.99 and the overall posttest mean score of haemoglobin in the control group was 10.14 with SD of 0.48. It showed that after the administration of beetroot juice, there was a high significant improvement in the haemoglobin level of adolescent girls with a „t‟ value of 12.633 at p=0.001.(Table.V) Hence the H2 stated earlier that „there is significant difference in posttest level of haemoglobin between experimental group and control group at p=0.001 was accepted . The findings revealed that

there was a significant difference between the study and control group in their haemoglobin level.

The study findings were be consistent with the study conducted by Ammu(2010) experimental study on effectiveness of beetroot juice on improvement of haemoglobin among 60 adolescent girls. The study revealed that the mean score was 12.07 with SD of 0.96 during posttest.

The third objective of the study is to associate the haemoglobin level with selected demographic variables.

Association revealed that the demographic variable (age in years, religion, number of children in the family, type of food, number of meals per day, does their meal contain vegetables, do they have history of anaemia,menstrual cycle,)had statistically significant association with the haemoglobin level at $p<0.001$ Hence, H3 stated earlier that „there is significant association between the posttest level of haemoglobin with selected demographic variables of study and control group at $p<0.001$ was was accepted for the demographic variables.

Hypothesis

H1: There will be significant difference between the level of haemoglobin before and after the administration of beetroot extract among adolescent girls.

H2: There will be significant association between the demographic variables and the level of haemoglobin among adolescent girls.

H3: There will be significant association between the clinical variables and level of haemoglobin before and after the administration of beetroot extract among adolescent girls.

The findings of the study unfolded that the overall pretest mean score of haemoglobin was 10.04 with SD of 0.58 and the overall posttest mean score of haemoglobin was 12.67 with SD of 0.99. It showed that after the administration of beetroot juice , there was a high significant

improvement in the haemoglobin level of adolescent girls with a „t‟ value of 17.787 at p=0.001.

Hence the H1 stated earlier that „there will be significant difference between the pretest and posttest level of haemoglobin in experimental group at p=0.001 was accepted.

The study revealed that the mean score was 12.07 with SD of 0.96 during posttest. Association revealed that the demographic variable was statistically significant association with the haemoglobin level at p<0.004.

Hence, H2 stated earlier that „there is no significant association between the posttest level of haemoglobin with selected demographic variables of experimental and control group was accepted.

The findings unfolded that the overall posttest mean score of haemoglobin in the control group was 12.67 with SD of 0.99 and the overall posttest mean score of haemoglobin in the control group was 10.14 with SD of 0.48. It showed that after the administration of beetroot juice, there was a high significant improvement in the haemoglobin level of adolescent girls with a „t‟ value of 12.633 at p=0.001

Hence the H3 stated earlier that „there will be significant difference in posttest level of haemoglobin between experimental group and control group at p=0.001 was accepted.

These findings are supported by Dr. N. Gayathri Priya .et.al(2013) ,conducted a true experimental study to assess the effectiveness of beet root juice on hemoglobin among adolescent girls. The objective of the study was to assess the effectiveness of beetroot juice on hemoglobin among adolescent girls. True experimental study design was adopted and the study conducted in Aringar Anna Government Higher Secondary School, Chennai, Tamilnadu. A total of 60 adolescent girls were selected for the study, in that 30 girls were in experimental and 30 girls were in the control group who fulfilled the inclusive criteria were selected by using simple random sampling technique. The freshly prepared

beetroot juice was administered to the samples for 20 days in mid morning. Pre and post assessment was done using the checklist for assessing the signs and symptoms of anemia and cyanmethemoglobin method for checking hemoglobin level.The data analysis was done by using descriptive and inferential statistics.Samples in the experimental group showed a highly significant improvement in hemoglobin level following the administration of beetroot juice ($p<0.001$), in comparison with the control group. The findings unfolded that the overall posttest mean score of haemoglobin in the study group was 12.67 with SD of 0.99 and the overall posttest mean score of haemoglobin in the control group was 10.14 with SD of 0.48. It showed that after the administration of beetroot juice, there was a high significant improvement in the haemoglobin level of adolescent girls with a „t" value of 12.633 at $p=0.001$.

CHAPTER- VI

SUMMARY CONCLUSION, NURSING IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS

This chapter presents a brief account of the present study. Conclusions are drawn from the findings and the implication of the results is started. It also includes recommendations for future research in this area.

SUMMARY

The present study was done to toevaluate the effectiveness of beetroot extract upon iron deficiency anemia among adolescents in selected school .

THE OBJECTIVES OF THE STUDY

- To assess the haemoglobin level among study and control group.
- To determine the effectiveness of beetroot juice on haemoglobin between study and control group
- To associate the pretest haemoglobin level with selected demographic variables

The design used for this present study is Quasi-experimental pre test post test design. Purposive sampling technique was adopted to select the samples based on inclusion and exclusion criteria. The total sample size was 60.

The content validity was checked by experts in the field of nursing and medicine and suitable modifications were made wherever needed.

Data regarding demographic variables were collected from school children and from school records. Clinical symptoms are assessed using clinical signs and symptoms check list. Haemoglobin was measured by using cyanmethemoglobin method.

The collected data were analyzed by using both descriptive statistics (mean, standard deviation, frequency, percentage) and inferential statistics (independent “t” test and chi-square test) and results were drawn.

MAJOR STUDY FINDINGS

- Majority of the adolescent girls in the experimental group 16(56.6%) were aged 15-16 years and in the control group 20(66.6%) were aged 15-16years.
- In relation to religion, majority of girls in the experimental group 26(86.67%) were Hindus and in control group 27(90%).
- With regard to type of family, 25(83.3%) in experimental group and 24(80%) in control group were from nuclear family.
- Regarding type of food , experimental group 27(90%) and control group 27(90%) were non vegetarian.
- With regard to history of anaemia , girls in the experimental group 30(100%) and control group 30(100%) had no history of anemia.
- In relation to menstrual cycle, majority of girls in the experimental group 26(86.6%) had regular menstrual cycle and in control group 22(73.33%) had regular menstrual cycle.
- In the experimental group, overall pretest mean score of haemoglobin was 10.04 with SD of 0.58 and the overall posttest mean score of Haemoglobin was 12.67 with SD of 0.09. It proved that after the administration of beetroot juice , there was a significant improvement in the Haemoglobin level of adolescent girls with a „t" value of 17.787 at $p<0.001$.Where as in control group overall pretest mean score of Haemoglobin was 10.14 with SD of 0.49 and the overall posttest mean score Haemoglobin was 10.14 with SD of 0.48. It showed that, there was no significant improvement in the Haemoglobin level of adolescent girls

- Association revealed that the demographic variable (age in years, religion, number of children in the family, type of food, number of meals per day, does their meal contain vegetables, do they have history of anaemia,menstrual cycle,)had statistically significant association with the pretest haemoglobin level at $p<0.001$.in experimental group.

CONCLUSION

Beetroot extract can be helpful to increase the hemoglobin level in adolescent girls.It shows that there is significant improvement in hemoglobin among the adolescents who consumed beetroot. The post test hemoglobin level was high in experimental group compared to control group. Hence beetroot is effective in increasing the level of hemoglobin.After completion of the study, the findings revealed the improvement of hemoglobin in experimental group. So the beetroot extract was given to the control group also. Thus beetroot have effectiveness in improvement of hemoglobin.

IMPLICATIONS OF THE STUDY

According to Tolsma(1995), the section of research report that focuses on nursing implications usually specific suggestions for nursing practice ,nursing education ,nursing administration and nursing research.

Nursing Practice

- The findings of the current study can be kept as base line for providing beetroot for anemia
- Beetroot extract upon iron deficiency anemia can be incorporated in nursing practice by making awareness which will improve the practice on beetroot consumption.
- Teaching program can be conducted to the nurses to demonstrate the procedure in various settings.

Nursing Education

- Preparation of beetroot extract can be taught to nursing students.
- It helps in improving knowledge for all nursing personnel in various aspects.

Nursing Research

- The study findings can be added to the research review regarding the beetroot extract upon anemia
- The study findings can be kept as the baseline data and further research can be conducted in same setting.
- The findings of research study will help in building and straightening the knowledge.

Nursing Administration

- The nurse can become an effective coordinator and leader by introducing this method in community settings.
- The nurse administrator co-ordinates their work along with preventive, curative promotive,and rehabilitative aspects of care.

LIMITATIONS

- Long term follows up and care is not possible due to limited time.

RECOMMENDATIONS

- The same study can be conducted in different settings such as schools, colleges, community etc
- The study can be conducted in school children of any age.
- The study can be done in large samples.
- The study can be conducted as a descriptive study among school teachers to assess their knowledge on anemia.
- The study can be conducted as a true experimental study.

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APPENDIX-A

ELLEN COLLEGE OF NURSING

(Recognized by Government of Tamilnadu and Indian Nursing Council, New Delhi
Affiliated to the Tamilnadu Dr. M.G.R. Medical University, Chennai)

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Website : www.ellencollegeofnursing.org E-mail : ellencollegeofnursing@gmail.com

Dr. A. GUNASINGH EMMANUEL, M.A., B.L., Ph.D.,
Chairman & Correspondent

Date :

Ref : EcN/PG.Dissert. Perm./2014-16

To

Respected Sir,

J. JEBA SARANYA is a student of Ellen College of nursing; Coimbatore is studying in M.Sc (Nursing). She is conducting **"An Experimental study to evaluate the effectiveness of Beetroot extract upon Iron deficiency anemia among adolescent girls at selected School in Kaniyakumari District."**

This is for her research work to be submitted to the Tamilnadu Dr.M.G.R. Medical University in partial fulfillment of the university requirement for the award of M.Sc (Nursing) degree.

As a part of her study, she would like to collect data from the Adolescent Girls from your well authorized School. Project will be furnished by the students personally. The norms, ethics and policies in the unit will be followed by the students.

Thanking You.

Yours faithfully

PRINCIPAL
PRINCIPAL
ELLEN COLLEGE OF NURSING
NAVAKKARAI, COIMBATORE - 641 105

ELLEN COLLEGE OF NURSING

(Recognized by Government of Tamilnadu and Indian Nursing Council, New Delhi
Affiliated to the Tamilnadu Dr. M.G.R. Medical University, Chennai)

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Dr. A. GUNASINGH EMMANUEL, M.A., B.L., Ph.D.,
Chairman & Correspondent

Date :

Ref : ECN/cont vali/2014-15

REQUISITION FOR CONTENT VALIDITY

From

J. Jeba Saranya,
II Year M.Sc (Nursing),
Ellen College of Nursing,
Coimbatore-641 105.

Through

The Principal,
Ellen College of Nursing,
Coimbatore-641 105.

To

PRINCIPAL
ELLEN COLLEGE OF NURSING
NAVAKKARAI, COIMBATORE - 641 105

Respected Sir/ Madam,

Sub: Requisition for expert opinion and suggestion for content validity of the tools – Reg.

.....

I am a student of M.Sc (Nursing) II Year of Ellen College of Nursing, Coimbatore affiliated to the Tamilnadu Dr.M.G.R. Medical University Chennai. As a partial fulfillment of the M.Sc (Nursing) programme. I am conducting "**An Experimental study to evaluate the effectiveness of Beetroot extract on Iron deficiency anemia among adolescent girls at selected School in Kaniyakumari District".** I am hereby enclosing the following:-

1. Statement and objectives of the study
2. Hypothesis
3. Methodology
4. Tool
5. Intervention
6. Content Validity Certificate

I kindly request your guidance and valuable suggestions on the content submitted with this. it would be helpful for me to proceed my dissertation.

Thanking you

Place: Coimbatore

Yours faithfully,

Date: 25.5.15

APPENDIX-D

ELLEN COLLEGE OF NURSING

(Recognized by Government of Tamilnadu and Indian Nursing Council, New Delhi
Affiliated to the Tamilnadu Dr. M.G.R. Medical University, Chennai)

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Dr. A. GUNASINGH EMMANUEL, M.A., B.L., Ph.D.,
Chairman & Correspondent

Date :

Ref : ECN/Cont.Vali. Cert/2014-15

CERTIFICATE OF VALIDATION

This is to certify that the tool submitted by **Ms.J.JEBA SARANYA., M.Sc (Nursing)** II Year of student of Ellen College of Nursing Coimbatore, (Affiliated to the Tamilnadu Dr.M.G.R. Medical University, Chennai) is validated by undersigned and can proceed with this tool and conduct the dissertation entitled **"An Experimental study to evaluate the effectiveness of Beetroot extract on Iron deficiency anemia among adolescent girls at selected School in Kaniyakumari District."**

Place: SIGNATURE

Date: Name & Designation

APPENDIX-E

FORMAT FOR CONTENT VALIDITY

Name of the expert:

Address:

Kindly review the items in the tool and tick wherever applicable

S. NO	No .OF TOOL/SECTION	RELEVANT	NOT RELEVANT	NEED MODIFICATIO N	REMARKS

Remarks

Signature of the expert with date

APPENDIX-F

CONSENT FORM

Dear Sir/Madam

I am Mrs. J. Jeba Saranya M.Sc., (Nursing) final year student of Ellen College of Nursing, Coimbatore. As a part of my msc nursing II year requirement I am doing a research on effectiveness of beetroot in preventing iron deficiency anemia among adolescent girls. So I would like to involve your daughter in my research. I kindly request your cooperation to complete my research. I assure you that your daughter will not get any harm due to my research. This is only for education purpose and the confidentiality of your responses will be maintained.

Dear Students

I am Mrs. J,Jeba Saranya M.Sc., (Nursing) final year student of Ellen College of Nursing, Coimbatore.As a part of my msc nursing II year requirement I am doing a research on effectiveness of beetroot in preventing iron deficiency anemia among adolescent girls. This is only for education purpose and the confidentiality of your responses will be maintained.

Yours Sincerely

APPENDIX-G

SECTION I

BACK GROUND VARIABLES

Instruction

Read the following questions carefully and give tick in appropriate options.

Sample No----------

1] Age

a) 13-14 years

b) 14-15 years

c) 15-16 years

d) 16-17years

2] Religion

a) Hindu

b) Christian

c) Muslim

3] Type of family

a) Joint

b) Nuclear

4**] Type of food**

a) Vegetarian

b) Non vegetarian

4] Meals per day

a) One

b) Two

c) Three

5] Does meals contain more vegetables

a)Yes

b)No

6] Do you have anemia before

a) Yes

b) No If yes [are they taking medicine]

7] Menstrual cycle

a) Regular

b) Irregular [mention the irregularities]

8] Height

9] Weight

10] Body mass index

SECTION II

CLINICAL SYMPTOMS AND SIGNS CHECKLIST

Clinical symptom checklist consisted of ten items with a single answer. Scoring „2" was given when the clinical symptoms were always present, scoring „1" was given when the clinical symptoms were occasionally present and scoring „0" was given when the clinical symptoms was never present. Total score of the items was „20". Maximum score was 20 and minimum score was 0. And the score interpretation was mild anemia (1-7), moderate anemia (8-14) and severe anemia(15-20).

	SYMPTOMS AND SIGNS	✓	X
1	FEEL TIRED OR WEAK MORE OFTEN THAN USUAL		
2	LIGHTHEADEDNESS WHEN YOU STAND		
3	FEELING GRUMPY		
4	SORE TONGUE		
5	EXPERIENCED SHORTNESS OF BREATH		
6	HEADACH		
7	VERY HEAVY MENSTRUAL FLOW		
8	DRY NAILS		
9	PALER COMPLEXION		
10	FATIGUE		

SECTION III

CLINICAL PROFORMA USED TO MEASURE THE HAEMOGLOBIN LEVEL BY USING CYANMETHEMOGLOBIN

Haemoglobin level classified as per WHO criteria

- 12gm% - Normal (excluded)
- 10- 11.9gm%- Mild anaemia
- 7- 9.9gm%- Moderate anaemia
- <7gm%- Severe anemia (excluded)

APPENDIX-H

tsupdk; ngz;fSf;F ,Uk;Gr; rj;J Fiwtpdhy; Vw;gLk; ,uj;j Nrhifia gPl;&l;

[P]; %yk; eptu;j;jp gw;wpa Xu; Nrhjid Ma;T

gpd;ddp fhuzpfs;

1. taJ
   m) 13-14 tUlk; M) 14-15 tUlk; ,) 15-16 tUlk; 16-17 tUlk
2. kjk;
   m) ,e;J M) fpwp];jtk; ,) K];yPk;
3. FLk;gj;jpd; jd;ik
   m) $l;Lf; FLk;gk; M) jdpf;FLk;gk;
4. cztpd; jd;ik
   m) irtk; M) mirtk;
5. jpdKk; vLf;Fk; rhg;ghl;bd; msT
   m) xd;W M) ,uz;L ,) %d;W
6. rhg;ghl;by; mjpf msT fha;fwp cs;sjh
   m) Mk; M) ,y;iy
7. jq;fSf;F ,jw;F Kd;dhy; ,uj;j Nrhif cz;lh
   m) Mk; M) ,y;iy
8. khjtplha; Roy;
   m) xOq;fhf cs;sJ M) xOq;fw;w cs;sJ
   (ve;j tpjk; vd Fwpg;gplTk;)
9. cauk;
10. vil
11. cly; vil FwpaPL

kUj;Jt uPjpahf Vw;gLk; mwpFwpfs;

1. ,ay;G epiyia tpl mbf;fb cly; Nrhu;T Vw;gLk;
2. cly; epiy f\;lkhf ,Ug;gjhf czu;tJ.
3. ehf;F tPq;fp ,Ug;gJ
4. %r;R thq;fy; ,Ug;gJ
5. jiytyp

6. mjpf mstpy; khjtplha; Vw;gLtJ
7. efk; twz;bUg;gJ
8. cly; ntsUtJ
9. cly; Nrhu;Tld; ,Ug;gJ

kUj;Jt mwpFwpfSf;fhd tpgug; gl;baypy; gj;J tiffs;> xU tpilAld; ,Uf;Fk;. kUj;Jt mwpFwpfs; vg;NghJk; ,Ue;jhy;> ,uz;L kjpg;ngz;fs; toq;fg;gLk;. mit vg;NghjhtJ ,Ue;jhy; xU kjpg;ngz; toq;fg;gLk;. xUNghJk; ,y;iy vd;why; G+[;[pak; kjpg;ngz; toq;fg;gLk;. Fiwe;j gl;r kjpg;ngz; G+[;[pak; kw;Wk; mjpf gl;rk; kjpg;ngz; ,UgJ MFk;. kjpg;ngz; xd;W Kjy; VO tiu ngw;wpUe;jhy; ,Nyrhd ,uj;j Nrhif vdTk;> vl;L Kjy; gjpdhd;F tiu kjpg;ngz; ngw;wpUe;jhy; Rkhuhd ,uj;j Nrhif vdTk; gjpide;J Kjy; ,UgJ tiu kjpg;ngz; ngw;wpUe;jhy; fLikahd ,uj;j Nrhif vdTk; fzf;fplg;gl;Ls;sJ.

`PNkhFNshgpd; kUj;Jt gpd;ddp msit Nahd;kPj;jpNkh FNshgpd; %yk; fz;Lgpbf;Fk; Kiw :

cyf Rfhjhu epWtdj;jpd; msT Nfhypd; gb ,uj;j epwkpapd; msT fPo;fz;lthW gpupf;fg;gl;Ls;sJ

- 12gm% - ,ay;G epiy
- 10-11.99% - ,Nyrhd ,uj;j Nrhif
- 7-9.9 gm% - Rkhuhd ,uj;j Nrhif
- 79m% -f;F FiwT : fLikahd ,uj;j Nrhif

,uj;j Muha;r;rp fz;Lgpbg;G rupahd Kiwapyhd Nrhjid tbtikg;gpd; %yk; fz;lwpag;gl;lJ MFk;. ehk; vLj;Js;s khjpupahdJ muRg; gs;spapy; gbf;Fk; 15-17 taJila 60 tsupdk; khztpfs; MFk;. ,e;j Muha;r;rpapy; 100 fpuhk; gPl;Ul;bd; [P]; rj;J mjpy; 50 kpyp. jz;zPuk; 15 fpuhk rPdp vd;w mstpy; fyf;fg;gl;Ls;sJ. ,e;j fyit apy; 100 kp.yp [P]; jpdKk; fhiyapy; xt;nthU khztpf;Fk; 20 ehl;fs; nfhLf;fg;gl;lJ. khjpup Nju;e;njLg;gjpy; gy jug;gl;l khjpup Kiw ,jpy;

gad;gLj;jg;gl;lJ. ,e;j Muha;r;rp Kiw gpd;ddp fhuzpfs;> kUj;Jt mwpFwpfs; Mfpatw;iw gad;gLj;jp nra;ag;gl;ljhFk;